MILL SECTION of
Concrete

SEVEN MILES OF ROTARY KILNS

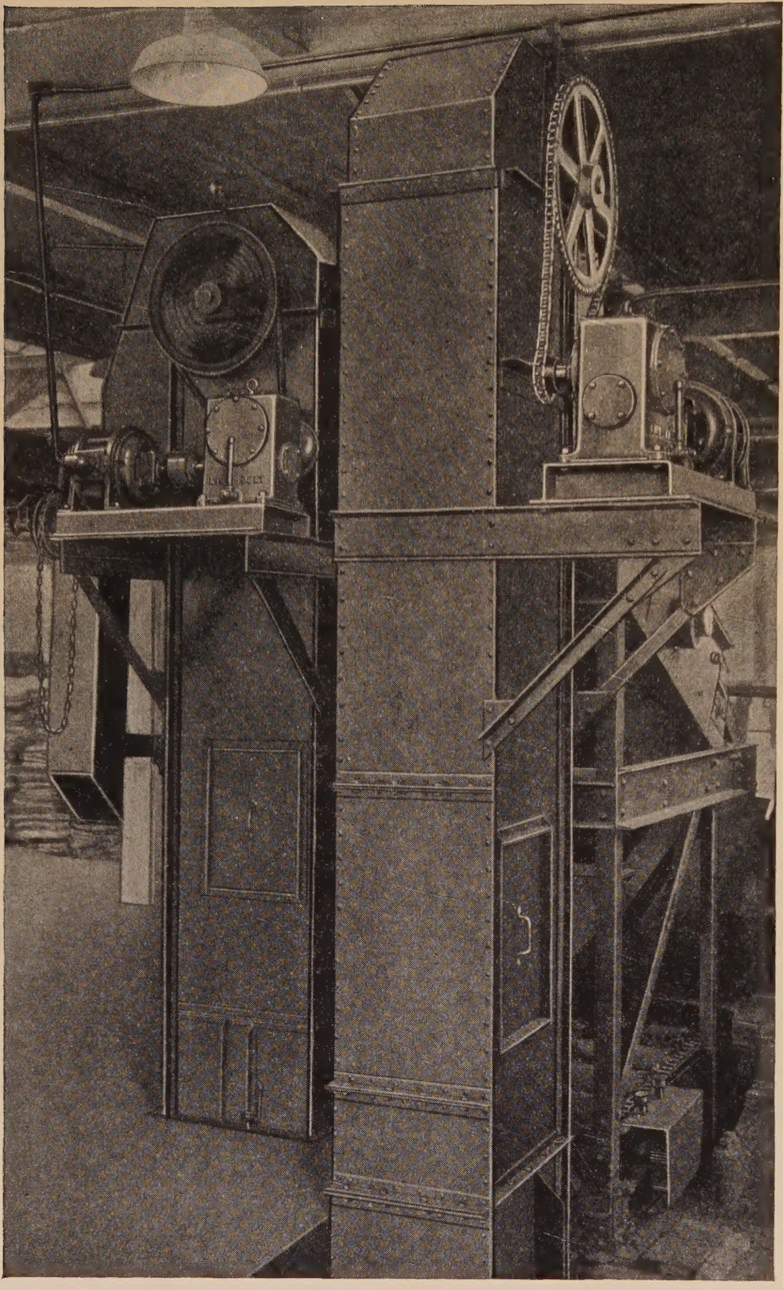
During the years 1927-30, the Smidth organization sold 139 Rotary Kilns. The total length of these is about ***seven miles,*** and their annual output more than 60,000,000 barrels. Of these, 125 are Unax Kilns with the cooling cylinders mounted on the outlet end of the kiln shell. Among these are several kilns 400 feet long.

Four Unax Kilns, furnished by F. L. Smidth & Co., for a cement plant in North America

Increased fuel economy, improved operation of kiln, effective cooling, better and easier grinding clinker, lower installation cost and other advantages of these modern kilns, account for their enthusiastic reception.

Write for information

F. L. SMIDTH & COMPANY
ENGINEERS
225 Broadway ~ ~ New York, N. Y.
Designers and Equippers of Cement Making Factories



BUCKET ELEVATORS

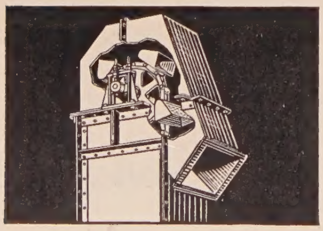
FOR handling any kind of loose material under all conditions and for all capacities, there is a Caldwell Bucket Elevator suited to the requirements. Caldwell make everything entering into the complete unit in their own shops—buckets of all types and sizes, casings, head drives, chains, sprockets, gears, boots, etc.; and have had over fifty years of experience in the design and application of material handling equipment. Send for catalog.

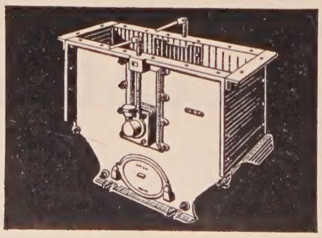
C-183

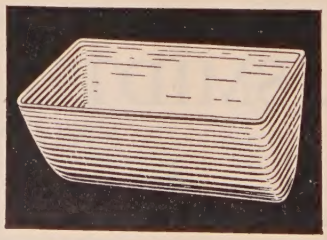
H. W. CALDWELL & SON CO.
DIVISION, LINK-BELT COMPANY
CHICAGO, 2410 W. 18th Street
New York Dallas New Orleans
Atlanta Birmingham Los Angeles
Offices in Principal Cities

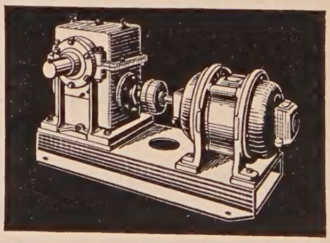
CALDWELL

ELEVATORS - CONVEYORS
POWER TRANSMISSION EQUIPMENT









Index to Advertisers on Page 67 of this Section

MILL SECTION of
Concrete

The Cement Mill Edition of Concrete is edited exclusively for those interested in the manufacture of portland cement. Its pages are devoted to discussions of plant design, management, operation, production efficiency, chemical research and control, quarry operation, progress and news of the industry.

The Cement Mill Edition also contains all the material published in the corresponding Regular Edition and so provides news of the uses and merchandising of the materials whose manufacture is discussed in the Mill Edition. The Regular Section furnishes mill operating officials and mill executives valuable points of contact with the users of the materials they produce.

Volume 38 June, 1931 Number 6

CONTENTS

Largest Cottrell Precipitator Being Built by Universal Atlas *(Illus.)* 69
Description of method of installation and tying up with related units; how completed process will operate.

Finding Undeveloped Sources of Fuel for Cement Plants 74
E. T. Ellis outlines the utilization of lignites in various sections of the United States.

Editorial 77
Good Advice From Another Industry.
Light-Weight Aggregates Help Cement Industry.
A Dangerous Practice With Blasting Caps.

Detailed Story of Operating Methods at Giant's Reliance Quarry *(Illus.)* 78
S. G. McAnally tells methods used in producing 30,000 tons per month.

Exhibit of Cement Manufacture to Build Up Public Interest 83
Century of Progress Exposition offers chance to acquaint public with cement manufacturing processes.

Accidents From Use of Powdered Coal Can Be Avoided 85
D. A. Davis, in regional safety paper, describes sensible control of imminent factor.

Cement Statistics for April *(Illus.)* 89

Men and Mills 90
Activities of other cement men.

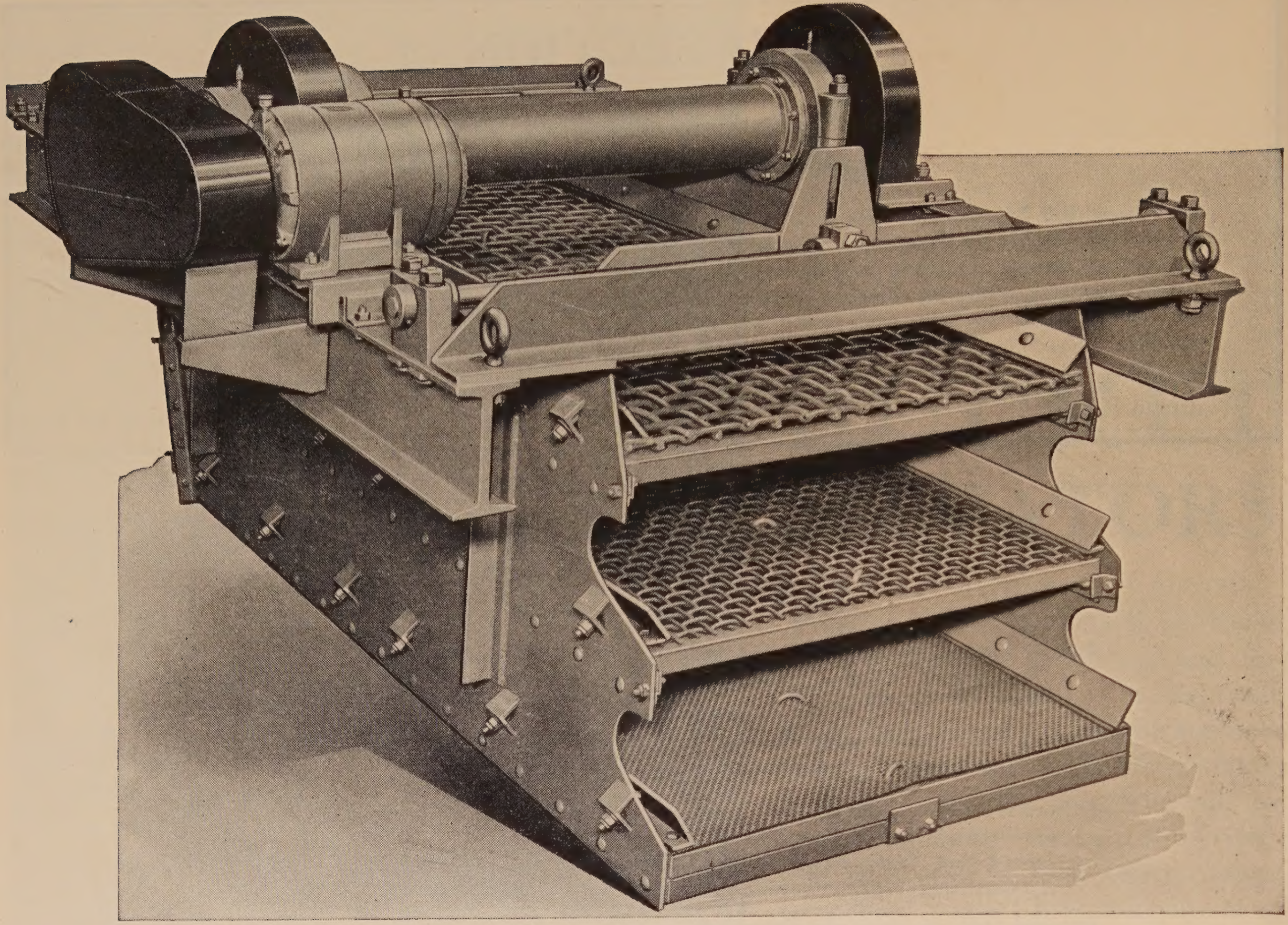
Mill Equipment 91

About the Manufacturers of Equipment 92

Copyright, 1931, by Concrete Publishing Co.

INDEX TO ADVERTISEMENTS

Allis-Chalmers Mfg. Co. 68
Autocar Co. Back Cover
Caldwell & Son Co., H. W. 66
Dixie Mchy. Mfg. Co. 96
du Pont de Nemours & Co., Inc. 93
Engineering & Designing 62
Kritzer Co., The 62
Link-Belt Co. 94-95
Smidth, F. L., Co. 65
Super Cement Co., The 64



Screen, Motor and Drive

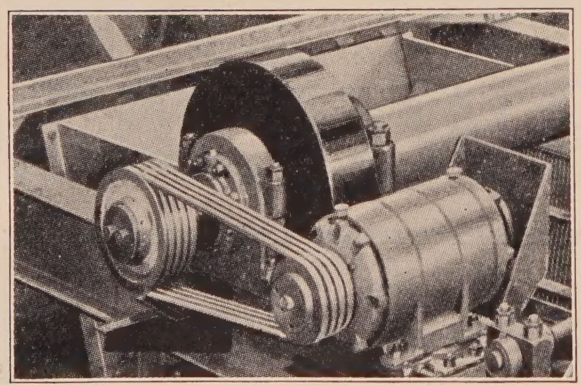
a Complete Unit... Sturdy and Well Built

When you buy an Allis-Chalmers vibrating screen, either one, two or three deck, you get a unit that needs but to be suspended and it is ready to operate. It is not necessary to buy a motor and drive and then find some place to install them as they are built into the screen at the factory.

The motor, a product of Allis-Chalmers, is of the totally enclosed fan-cooled type, dirt-proof and water-proof. It is so thoroughly protected that you can turn a stream of water on it while it is running and not harm it.

The Texrope Drive, originated by and built by Allis-Chalmers is slipless, vibrationless and flexible. Dirt and water cannot hurt it. It is large enough to carry any overloads that may be demanded of it.

With the screen, motor and drive built by one organization the responsibility for the successful operation of the unit rests on that organization. For further details on Centrifugal Vibrating Screens get in touch with the nearest Allis-Chalmers office, or write for Bulletin 1470-B



Motor and Texrope Drive on an Allis-Chalmers Centrifugal Vibrating Screen

ALLIS-CHALMERS

Allis-Chalmers Manufacturing Company, Milwaukee

MILL SECTION of

Concrete

Vol. 38 Chicago, June, 1931 No. 6

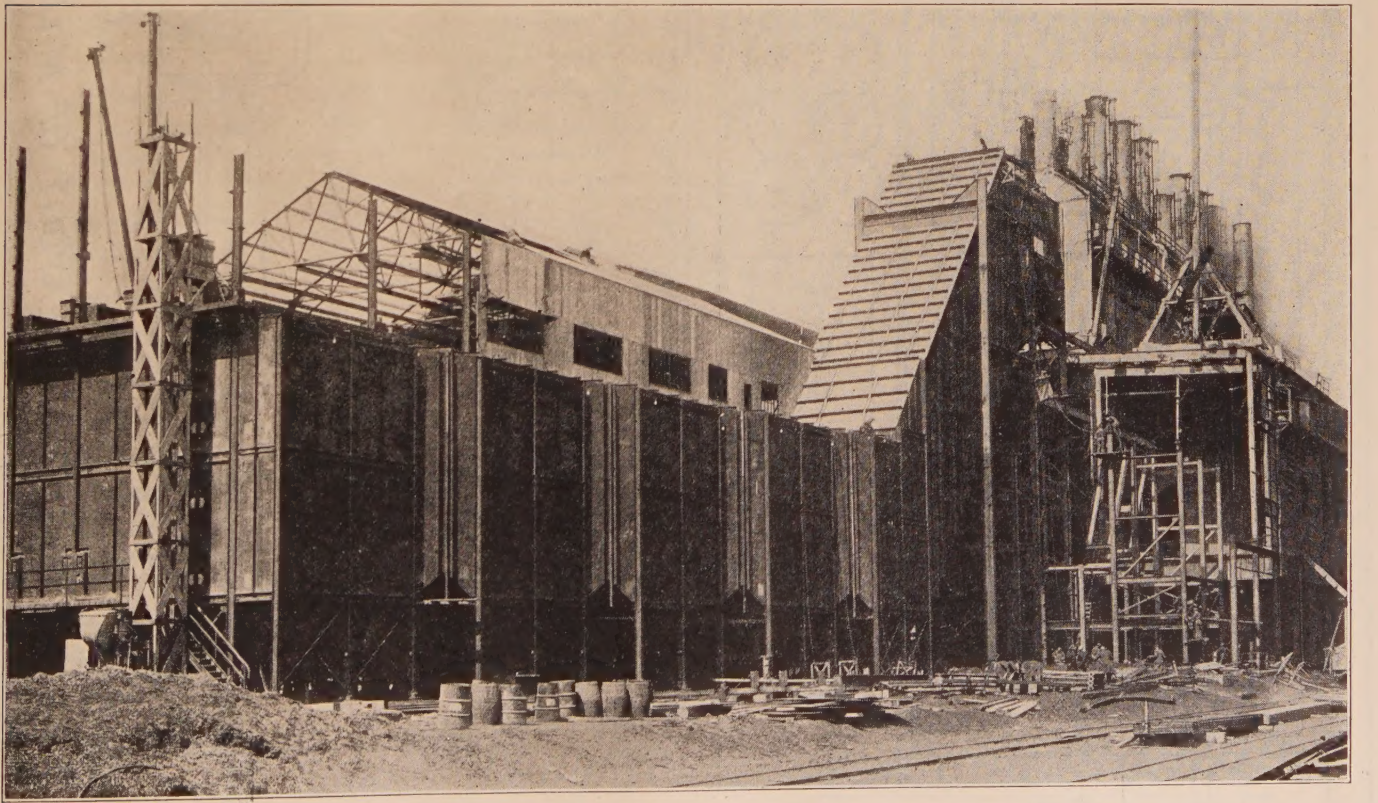
Largest Cottrell Precipitator Being Built by Universal Atlas

Installing Latest Improvements in Electrical Precipitation of Dust—Five Double Units to Handle Million Cubic Feet of Air Per Minute

A NEW Cottrell precipitator, said to be the largest installation of its kind, is now under construction at Mill No. 6 of the Buffington plant of the Universal Atlas Cement Company. This installation utilizes the most modern developments in this method of removing suspended dust particles from gases and dust-laden air by electrical precipitation. Its progress up to date is described and illustrated below.

Fundamental Principles of Process

The electrical precipitation of suspended dust particles from gases is accomplished by passing the dust-laden gases through a high potential unidirectional electrical field, between two oppositely charged electrodes. One of the electrodes, of small area, is designated as the discharge (or negative) electrode; the other, of larger area, is called the collecting (or positive) electrode. The collecting



View of electrical precipitator building from northeast, showing the inlet flue

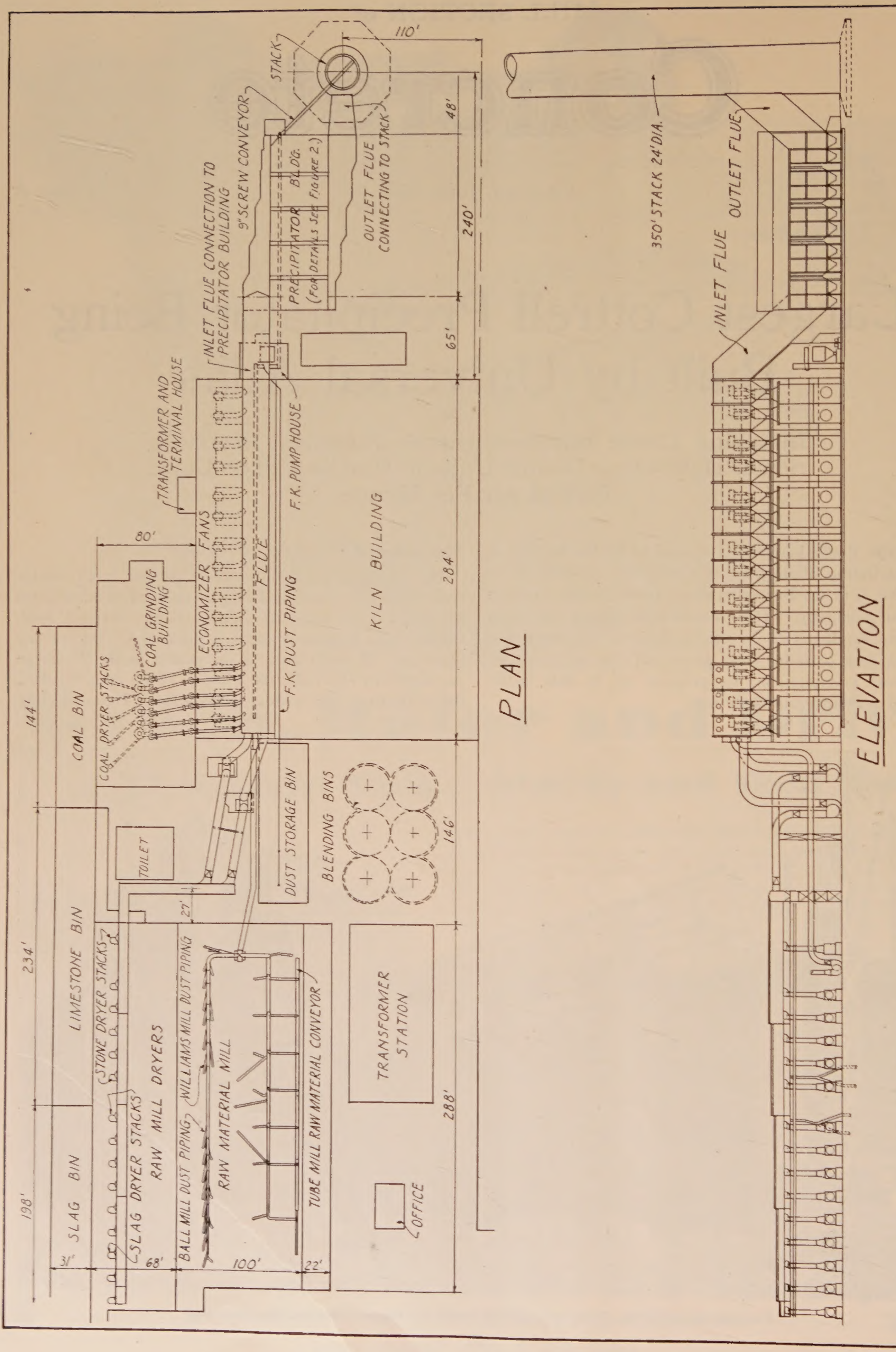


FIGURE 1 - LAYOUT OF MILL NO. 6-DUST COLLECTING SYSTEM

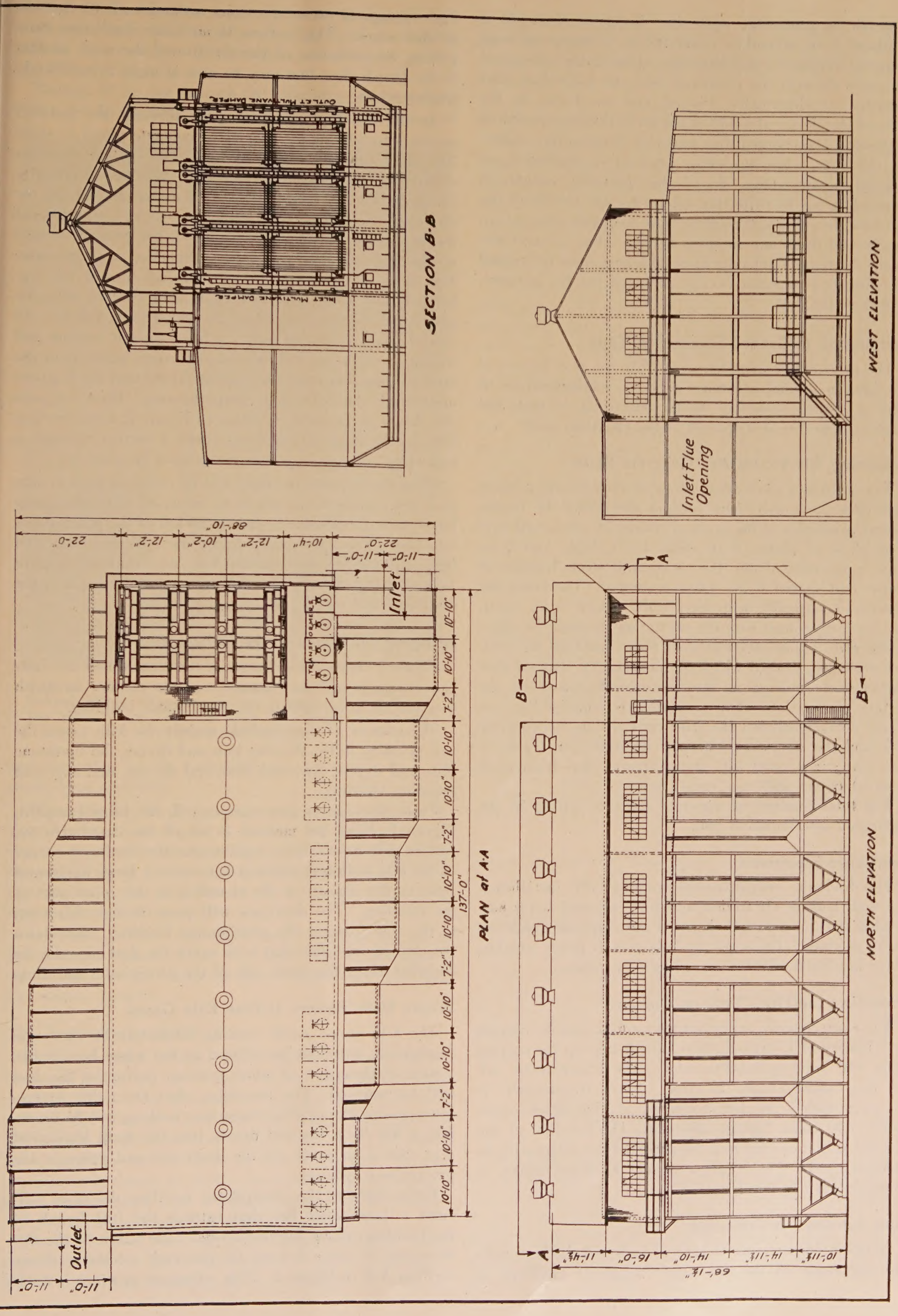


Figure 2. Plan, cross sections, and side elevation of Mill No. 6 of the Universal Atlas Cement Company, at Buffington, Indiana

electrode is grounded, while the discharge electrode is insulated from it and is connected to a source of high potential unidirectional electricity. During the passage of the gases through the electrical field the individual dust particles are electrically charged, and are driven by the force of the electrical field toward the collecting (positive) electrode. The charged dust particles cling to the collecting electrode, while the clean gases pass, unaffected, on through the apparatus. As the dust particles continue to accumulate on the collecting electrodes, the weight of the accumulation causes the entire mass to break away at intervals and drop into hoppers below. Dust accumulates on the discharge electrodes also, and these must be rapped periodically by special devices arranged for the purpose, to remove the dust.

Installation Is Graded Resistance Type

The precipitator installation at Mill No. 6 is known as the modern graded resistance type, so constructed as to offer a graded resistance to the electrical current and insure an effective distribution of the electrical field.

Collecting Electrodes Are Concrete Slabs

The collecting electrodes, corresponding to the positive electrodes previously mentioned in describing the fundamental principles of the process, consist of reinforced concrete slabs or plates, 6 ft. wide, 13 ft. high, and 2 in. thick, suspended from the structural steel framework above, and spaced 8 in. center to center. The slabs are reinforced vertically with steel rods, spaced 6 in. apart, and forming contact with the steel frame around the edges of the slab. These vertical steel rods constitute the positive electrode, toward which the electrically charged dust particles are moving as they become deposited on the surface of the slab. The grounding is obtained because of the contact between the steel rods within the concrete slab and the steel frame around the slab, the frame in turn being in contact with the structural steel framework from which the slabs are suspended.

The total number of concrete slabs or plates in the Buffington installation is 960.

Discharge Electrodes

The discharge (negative) electrodes in this installation are high tension electrodes consisting of steel wires suspended at 6 in. intervals, between the suspended concrete plates or slabs. The wires are held taut by heavy weights. There are 5,400 of these wires in the installation.

Providing the High Tension Current

The electrodes are energized with a high tension current by a battery of 15 transformers, which step up the current from 440 volts to 50,000 volts. The transformers are 15 kva. single-phase, 25-cycle. Each transformer is equipped with a rectifier driven by a 2-hp. synchronous motor, 440 volts, 3-phase, 25-cycle. The function of the rectifier is that of changing the current from alternating to unidirectional. The location of the 15 transformers is shown in Plan A-A in Figure 2.

How the Dust Is Collected

In this graded resistance type of collector the high voltage impressed on the discharge (negative) electrode is high enough to create a corona around each of the suspended wires. This corona is an ionic discharge, comprising an ionization of the air around the wire, similar to the bluish glow that may be seen at night around high-tension wires.

As the dust-bearing gases pass through the parallel passages formed by the suspended concrete plates or slabs the dust particles pass through the corona currents emanating around the wires and become electrically charged. The charged particles are driven away from the discharge electrodes (the suspended wires) and toward the positive electrodes consisting of the grounded steel reinforcing rods imbedded in the suspended concrete slabs. The charged dust particles, in moving toward the imbedded steel rods, naturally come into contact with the surface of the concrete slabs, to which they adhere. In time the layers of dust built up have enough volume and weight to overcome the electric attraction, whereupon the clots of dust fall from the concrete slabs into the hoppers underneath the collecting compartments. These hoppers are shown in the north elevation in Figure 2, while Section B-B, in the same illustration, shows a section through a collecting compartment and the hopper beneath it.

From the hoppers the dust will be removed by a system of screw conveyors arranged to transport it to the pump house shown in Figure 1, just to the left of the precipitator building. From the pump house the collected dust will be pumped to the dust storage bin (also shown in Figure 1) and then fed back into the raw material stream at the discharge end of the raw grinding mills.

Bringing the Gases to the Collector

Figure 1 shows the various sources from which the dust-bearing gases will be obtained and the manner in which they are to be brought to the precipitator building.

The sources of dust include mainly the kiln cases, the raw grinding mills, the slag bins and dryers, the limestone bins and dryers, the coal bins and dryers, and the coal grinding building.

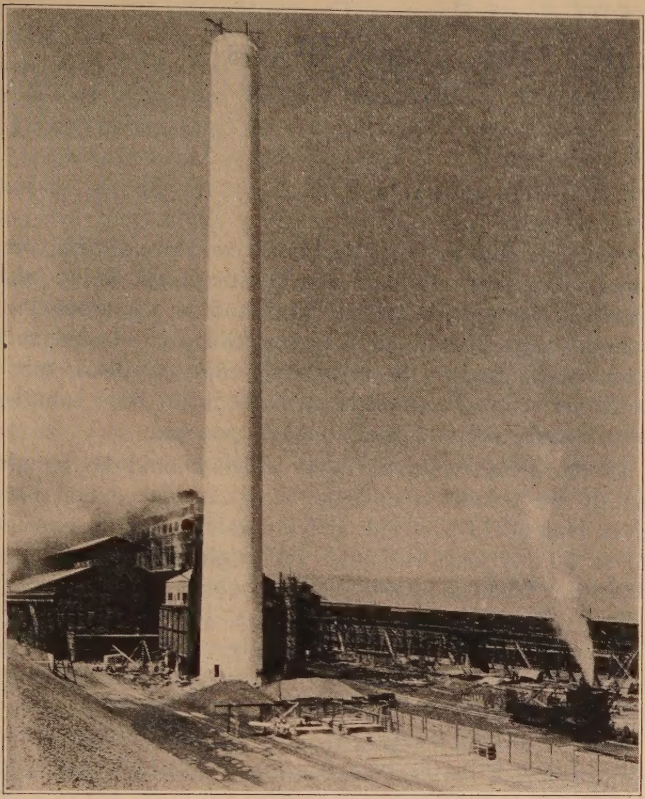
From the sources just enumerated, the kilns excepted, Figure 1 shows the manner in which the dust-laden air will be driven by fans to a point near the northwest corner of the kiln building, where it is to enter a large horizontal vent, or flue, shown on the elevation in the upper part of the building. The dusty air will pass through this vent, to the right toward the precipitator building, then down the sloping inlet flue that is to carry the dust into the air chamber along the north side of the precipitator building.

Waste Heat Boilers Utilize Kiln Gases

The kiln gases, while coming ultimately to the same destination, will first be utilized in the waste heat boiler system, in the course of which a minor portion of the dust will be removed. The remaining dust from this source, after passing through the waste heat boilers, will be drawn into a flue by a fan and driven into the main horizontal vent that is to carry all the dusty air and gases to the precipitator building.

Upon entering the precipitator building the gases will enter a large inlet flue that extends the full length of the building, along the north side. The width of the flue decreases, by steps, toward the east end, as clearly shown in Plan A-A in Figure 2. This reduction in width is made in view of the fact that some of the air passes through multi-vane dampers into the collecting compartments at each of the five units. The dampers are indicated on Section B-B of Figure 2.

Passage of the gas through the collecting compartments, where the dust particles are to become electrically charged and deposited on the collecting concrete slabs, have already been described.



General view showing precipitator building immediately behind 350-ft. chimney. In the foreground is the casting yard where concrete slabs are made for use as collecting electrodes

When the gas finally passes through the outlet multi-vane dampers, also shown in Section B-B of Figure 2, it will be practically free from dust. This outlet flue, along the south side of the precipitator building, has the same dimensions as the inlet flue on the north side, but it increases in width from west to east.

As shown in the lower right-hand corner of Figure 1, the clean air passes from the outlet flue to the 350-ft. reinforced concrete stack, through a large connecting flue that slopes upward.

The Precipitator Building

The precipitator building is a compact structure, 137 ft. long and 44 ft. 10 in. wide, exclusive of the inlet and outlet air flue. The building is composed of five double units, as the plans show, each of double-deck construction. The outside shell consists of welded steel plates, all joints being carefully welded so as to have the collecting compartments absolutely air-tight. Construction engineers engaged on this work have estimated that the welded joints and seams totaled more than 4 miles in length.

The precipitator building, now about completed, is designed to handle 1,050,000 cu. ft. of gas per minute. Mill No. 6, which it serves, has a production capacity of 15,000 barrels per 24-hour day. Consequently the gas handling capacity provided in the collector amounts to about 70 cu. ft. of gas per minute, per barrel of daily capacity.

Reinforced Concrete Chimney

The reinforced concrete chimney has an outside base diameter of 24 ft. and will be 350 ft. high when completed. The inside diameter is 15 ft. The chimney was built to a height of 150 ft. in the fall of 1930, after which work was suspended until spring of this year.

Slabs Cast on Construction Site

The reinforced concrete slabs or plates comprising the collecting electrodes in this installation were cast in a temporary plant set up for the purpose, near the construction site, just east of the precipitator building.

Acknowledgments

The precipitator was designed by the Western Precipitation Company, Los Angeles, Calif., and is being built under contract by the construction department of that company, working in close co-operation with the engineering department of the Universal Atlas Cement Company. While the precipitator building proper is now practically completed, alterations and new construction work required to connect the precipitator with the various sources of dust will require many months for their completion.

Penn-Dixie Net Income for Twelve Months Jumps 41 Per Cent

The Pennsylvania-Dixie Cement Corporation reports for the twelve months ended March 31, 1931, net income of $467,202 after depreciation, depletion, interest and federal taxes, equivalent to $3.44 a share on 135,888 shares of 7 per cent preferred stock.

This compares with $329,136 or $2.42 a share on preferred for the previous twelve months.

Bill Ordering Sale of Michigan Plant Passes House

Sale of the Chelsea state cement plant is ordered in a bill which passed the Michigan House on May 6 by a vote of 53 to 36.

The votes cast in opposition to the sale of the plant were based mainly on opposition to an attempt to sell the plant while prices are depressed, rather than to a belief that the state could continue to try to manufacture cement there.

Alpha Shares Earn $1.49 for Twelve Months

The Alpha Portland Cement Company reports for the 12 months ended March 31, 1931, net income of $1,198,812, after depreciation and federal taxes, equivalent after 7 per cent preferred dividends, to $1.49 a share on 711,000 no-par shares of common stock. This compares with $1,654,098, or $2.13 a share, in the preceding 12 months.

Finding Undeveloped Sources of Fuel for Cement Plants

Lignites in Various Sections of United States Described in Fourth Article on Utilizing Low Grade Fuels—Manipulating Lignites to Enhance Calorific Value

By E. T. ELLIS, F. J. I.
Ecclesall, Sheffield, England

Lignites are not viewed with favor as fuels by the average cement company management, but in districts where other fuels are difficult to get and are much more expensive, they are well worth considering. In the present article, therefore, it is proposed to discuss some of the best of these from the angle of the cement factory, to show what their composition is to start with, and how they can be manipulated in order to render them useful types of fuel for cement manufacture.—The Author.

CEMENT plant managers should clearly grasp the fact that most of the lignites of the United States are soft in character, that much incombustible mineral matter is contained in them, and as a rule a big quantity of moisture.

Alabama Lignite Waste

Various low-grade and waste fuels from the lignite deposits of Alabama are available for use as fuel by cement corporations.

The composition of this refuse is similar to that of Mississippi lignite waste, the carbon content, i. e., the fixed carbon being relatively good, the moisture substantial, and the ash content rather heavy.

The most important step consists of drying these Alabama lignite wastes, the very wet forms giving up some of their moisture by treatment in powerful mechanical presses, after which air drying is resorted to. The modus operandi then consists of briquetting them with hardwood pitch, again employing powerful mechanical presses, and these briquettes are then used as such in the larger furnaces, or they are carbonized, i. e., heated in closed retorts until volatile matter ceases to escape. Then the lignite coke, as we may call it, is ground up along with good grade coal or coke and fired in the usual way.

Alaska Lignite Refuse

Considerable deposits of lignite are available in Alaska. The refuse from these mines varies considerably in composition, but most of the types are quite usable as cement factory fuel if properly manipulated.

Poor samples of Alaska lignite refuse will often only show a fixed carbon content of 30 per cent, but to compensate for this the volatile matter content is high compared with that of other non-lignitic fuels, being also about 30 per cent. The ash content, i. e., the amount of mineral matter which is incombustible, is always very considerable, and in the poorest samples may be as much as 28 per cent. The moisture content in the poor samples is very high, and ranges at about 24 per cent.

In the better samples, those which should be bought mainly for cement plants, the fixed carbon content may be as high as 43 per cent, and the volatile matter content up to 60 per cent, although this high figure is seldom attained. When the fixed carbon content is high, the ash content is usually low, and may be as little as 6 per cent. The moisture content in such samples is, as a rule, relatively small, and 10 per cent is what may reasonably be expected.

The calorific value of a fuel of this sort is difficult to estimate, but if the best grades are carbonized at 600 deg. C. after being briquetted, 11,250 b.t.u. should be attainable.

The modus operandi consists, in the case of those samples of Alaska lignite refuse which contain much ash, of first passing the residue along an endless band arrangement, so that lumps of non-lignitic shale can be thrown out. Following this, the whole of the consignment should be pressed to reduce the moisture content to about 10 per cent, if possible, by mechanical means. After that, as much further moisture as possible should be taken out by treatment in hot air ovens, taking care, however, not to reduce the volatile matter content by making the heat excessive. When dry enough, a small quantity of one of the many types of pitch is mixed with the material, the combination is pressed into briquettes of moderate size, and these are carefully carbonized in the complete absence of air in order to prevent oxidation from taking place. A temperature of 600 deg. C. is usually sufficient for this operation; but occasional types of lignite refuse to become carbonized at a lower temperature, while others, being harder and more like real coal, require a greater amount of heat to coke them.

The carbonized briquettes can, of course, be fired direct in the larger furnaces attached to the cement works, but it is more usual to grind them up after carbonization, and fire them in conjunction with coal dust, coke, or other recognized cement plant fuel.

Arkansas Lignite Residues

There are many types of Arkansas lignite residues, but those which are most suitable for employment as cement factory fuel show, on analysis, a fixed carbon content of about 25 per cent and a volatile matter content of a shade more, or 26.5 per cent. The ash content is relatively small compared with some lignitic fuels, being about 10 per cent in the best samples. The moisture content, unfortunately, is always considerable, and 39.5 per cent has been detected in many of the raw samples of these residues. A lignite residue fuel of the above composition has a comparatively moderate calorific value, this being about 6,300 b.t.u., but capable of being considerably enhanced.

The modus operandi here consists first of all of reducing the moisture content very substantially. It should be possible to get this down to 20 per cent by treatment in powerful mechanical presses, while some claim that if these presses are heated the moisture content can be reduced to 10 per cent. In any case, even after the most thorough pressure treatment, the lignite residues should be subjected to the action of hot air, taking care that its volatile matter content does not suffer in consequence of excessive heat. The air-drying process should be rather prolonged in character, so as to get rid of as much unwanted water as possible. When finally finished, the lignite residues will have a fixed carbon content of nearer 50 per cent, and a volatile matter content of about 40 per cent, allowing for unavoidable loss. The careful removal of moisture, therefore, enables us practically to double the calorific value of this inexpensive form of cement factory fuel.

Partial or complete carbonization is generally desirable, as an additional step, and the gases which come over should be collected, as they are usable or salable. The carbonized material is then ground up, and mixed with coal dust or other recognized cement fuel in about equal proportions.

California Lignite Culm

A culm or residue of the California lignite deposits is well worth consideration as a cement factory fuel.

In this the fixed carbon, volatile matter, and ash content together amount to approximately 60 per cent, while the moisture content is relatively high for so dry a climate, and is nearly always around 40 per cent. This gives us a fuel with only a moderate calorific value, round about 6,000 b.t.u., but this is very easily increasable to 9,250 b.t.u. if proper steps are taken. The moisture content, in its turn, is very easily reducible to roughly 10 per cent.

The modus operandi consists of sorting this California lignite culm along an endless band arrangement, so that small stony material and unburnable shale can be thrown out. The next step consists of pressing out as much moisture as possible by mechanical means, and a dark colored fluid, often thick in character, is obtained. The fluid is not worth while operating with further. To get the best results with a moisture-charged culm of this character, the presses should be heated, but a constant watch should be kept on the volatile matter which comes off, so as to avoid reducing the burnable portion. Treatment in mechanical presses even if they are heated, however, is not enough to make this lignite culm really usable in cement factories. The fuel should, therefore, be further air-dried in order to reduce the moisture content to below 10 per cent if possible. Here it is of still more importance to watch the gases which come out of these air-drying chambers for the presence of combustible matter, as most operators will apply far too much heat, and reduce the value of the culm instead of enhancing it.

Having air-dried the fuel, it is often advisable to make a volatile matter test by distilling in the absence of air a comparatively small quantity of the culm, and weighing the carbonaceous matter which remains, and also estimating the volume of the combustible gases which come over. If the volatile matter content is low it is hardly worth while going to the trouble and expense of carbonizing the refuse. However, if its volatile matter content compares favorably with that of the other lignite fuels discussed and to be discussed in this article, the whole consignment should be coked in much the same way as coal dust is coked, the volatile combustible gases being collected and freed from carbon dioxide by means of the usual lime towers. If they can be sold separately, the price obtained for them materially reduces the cost of the resulting fuel.

The carbonized lignite culm is then ground in conjunction with broken coke, small coal, or other recognized cement works fuel, and fired in a pulverized state.

Louisiana Lignite Pickings

Quantities of lignite pickings may be obtained in Louisiana at a cheap rate. It is hardly necessary to discuss the analysis of these in detail, as their composition is somewhat similar to that already given above in the case of Arkansas lignite residues.

The modus operandi consists of passing the pickings along an endless band arrangement, so that stony matter and obviously incombustible shale can be thrown out. Following this, thorough drying must be resorted to, for the moisture content of the pickings, even if they have been high and dry on a spoil bank for some time, is often very big. Lastly, the entire consignment of lignite pickings should be subjected to carbonization in closed retorts. Grind the lignite coke up, and mix it with coal dust, finely divided coke, or other recognized cement works fuel in about equal proportions.

Mississippi lignite waste is worth considering as cement factory fuel. Though rather variable in composition, its fixed carbon content and volatile matter content place it well within the purview of those who want cheap and usable fuels, provided that they are prepared to dry it thoroughly, as its moisture content is often considerable.

It is best to briquette the dried lignite waste; and although coal or wood pitch can be used as the binding agent, very good results will be obtained by employing a cheaper material in those districts where it can be picked up in big quantities, namely, spent sulphite liquor. This should be of a concentrated character, and just sufficient should be employed to hold the soft lignite waste together when the moist mass is treated in a suitable press.

These sulphite liquor lignite briquettes can be fired direct in the larger furnaces of the cement mills, or carbonized by heating the briquettes in consignments in capacious closed retorts until volatile matter ceases to come away, and a hard lignite coke remains. This is then ground up and mixed with coal slack, pulverized coke, or other recognized cement fuels in quantities ranging from 25 to 50 per cent.

Editor's Note: The next article will deal similarly with lignite deposits in North and South Dakota, Montana, Wyoming, Tennessee, Texas, and other sections of the United States.

Annual Spring Meeting of P.C.A. Discusses Technical Problems

George S. Bartlett to Head New Committee on Membership—Executive Committee Meets Again on July 14

The annual spring meeting of the Portland Cement Association, held in New York on May 11, 12 and 13, was attended by about 300 representatives of member companies. In accordance with a practice established several years ago, only representatives of member companies were admitted to the sessions.

Monday, May 11, was occupied with meetings of the various standing committees of the association, and the second day's sessions were devoted to the presentation of papers dealing with manufacturing problems and practices. An interesting paper presented during this session, by E. S. Ernst, chief chemist, Dewey Portland Cement Company, Davenport, Iowa, described that company's new installation for closed-circuit wet grinding of raw materials. Readers of the Cement Mill Edition of CONCRETE will recall the detailed description of this installation in the January, 1931, issue, pages 81 to 87.

The association annual meeting of 1931, it was decided, would be held at the Blackstone, at Chicago, on November 17 and 18. The first day's program will be occupied by committee meetings, and the second day by mill and general business sessions.

Eighty-six delegates representing 43 mills that won the association safety trophy by virtue of having completed the year 1930 without fatal or lost-time accidents were formally presented with the trophies in behalf of the mills, during the luncheon meeting on May 12.

An interesting development during the business session, held on the last day of the meeting, was the appointment of George S. Bartlett, for many years connected with the Universal Atlas Cement Company, as assistant to the chairman of the board of directors of the association. The chairman of the board is Frank H. Smith, president of the Lawrence Portland Cement Company.

Mr. Bartlett will give his entire time to the affairs of the association. He is to serve as secretary of a new committee charged with the task of lining up the old and new members in renewed association activities.

The board of directors of the association is to hold a special meeting on July 14, at Chicago.

Plants Resume Operations After Winter Shutdowns

The Lehigh Portland Cement Company plants at Oglesby, Illinois, and Iola, Kansas, the Medusa plant at Bay Bridge, Ohio, and the Petoskey plant at Petoskey, Michigan, were among the numerous plants to resume operation during April and May.

After having been shut down for more than two months, four of the seven kilns at the Lehigh Illinois plant were placed in operation on April 22, the remainder being reopened early in May. The Kansas plant resumed operation on April 27.

A shutdown of four and a half months was terminated when the Medusa Bay Bridge plant reopened on April 15 after having been closed down since December 1. The Petoskey plant reopened on May 15 after also having been closed since the first of December, while the Beaver Portland Cement Company plant at Gold Hill, Oregon, resumed on April 8 after having been closed down since early November.

The Ironton, Ohio, plant of the Wellston Iron Furnace Company likewise began full-time operation on April 24.

February Figures for Britain Show Fluctuations in Exports, Imports and Values

February exports of calcareous cement from the United Kingdom are placed at 374,851 barrels, valued at $495,984, according to official returns. This compares with 436,746 barrels, valued at $816,613, shipped in February, 1930.

The largest consignment in February, 1931, went to the Irish Free State, which took 53,981 barrels, compared with 34,132 barrels in the corresponding month of 1930.

British imports of cement in February, 1931, reached 53,968 barrels, compared with 116,548 barrels in February, 1930. The countries of origin are not reported, but it is believed that the larger part of these receipts came from Belgium, with the United States possibly furnishing some special white cements.

June, 1931, No-Accident Campaign Gets Off to Flying Start

Indications on the June, 1931, no-accident campaign of the Portland Cement Association as shown by executive and company enrollments point to another new low record for June accidents in the cement industry. Held during the mills' busiest month with the consequent greatest exposure to accidents, the sixth annual June drive on accidents is inaugurated with the largest advance registration of any previous campaign.

A total of 63 companies comprising 98 mills had enrolled in the campaign and 1,981 foremen and 23,700 workers' pledge cards had been requested by May 20.

June no-accident flags of special design for 1931 had been ordered by 98 per cent of the mills.

Associated Portland Manufacturers Show Increased Profits

Report of the Associated Portland Cement Manufacturers, Ltd., for the year ended December 31, 1930, shows a net profit of £387,649 after taxes, debenture interest, depreciation and provision for debenture stock redemption fund, equivalent after dividend requirements on 5½ preferred stock to 8.66 per cent on £3,000,000 common stock. This compares with £367,515 or 7.99 per cent on common stock in 1929.

Monolith Net Income Five Times Interest Charges

The Monolith Portland Cement Company for the year ended December 31, 1930, reports net income before interest charges, reserves and federal income tax of $315,892. This amount is more than five and a half times the interest charges for the year of $57,480.

EDITORIAL

Good Advice From Another Industry

AT the Atlantic City meeting of the United States Chamber of Commerce, late in April, Albert H. Morrill, president of the Kroger Grocery and Baking Company, of Cincinnati, had something to say that has a painfully direct application to the cement industry.

"If a friend of mine has one dollar," he said, "and I have one dollar, and we swap dollars, when the transaction is over we each have one dollar, as before. If this same friend has an original idea and I have an original idea on the same subject, and we swap ideas, we each have two ideas . . . thus making each of us richer than we were before."

Here, once more, is a simple illustration of what the cement industry is losing by its dogged refusal to establish a free exchange of ideas.

The interchange of knowledge about processes and other so-called manufacturing secrets within an industry, for the good of all, is almost a prerequisite to survival in these days of fierce competition between industries.

Light-Weight Aggregates Help Cement Industry

THE leading editorial in the March issue of the Cement Mill Section of "Concrete" pointed out the vast market possibilities for cement in buildings having steel frames embedded in concrete. Brief reference was made to the importance of light-weight aggregates in the development of this market.

The advantage of light-weight aggregates in building construction, whether the structural frame is of reinforced concrete or of structural steel, arises from the reduction in the dead weight of the building. Reduction in dead weight reduces the quantity of steel reinforcement or of structural steel required to carry that weight.

The assertion just made is well illustrated in an article by E. B. White, on pages 21 and 22 of the construction section of this issue, describing a building with its steel frame embedded in sand-haydite concrete, weighing 108 pounds per cubic foot. This was not even a true light-weight concrete, for only the coarse aggregate was light-weight material.

Notwithstanding the cost of $5.75 per cubic yard for the light-weight aggregate, compared with $1.65 for stone, money was saved by using the former. True enough, the concrete itself cost more, but the reduced dead weight resulted in a saving of 250 tons of structural steel, 80 tons of reinforcing steel, and 233 piles. In the final analysis there was an appreciable net saving. If the fine aggregate had also been of light weight the net saving would have been still greater.

It is no credit to the cement industry that the development of the most widely used light-weight aggregate is in the hands of the clay industry. On the other hand, this fact should not prevent the cement industry from doing everything possible to promote the greater use of light-weight materials as concrete aggregate, whether in monolithic concrete or in concrete masonry units.

Neither should the cement industry overlook the possibilities of other light-weight aggregates, several of which are on the market or in the course of development. These should be investigated, and those having merit should be encouraged. It is not improbable that in a few cases, at least, a moderate amount of capital is all that is lacking.

A Dangerous Practice With Blasting Caps

AGAIN the directors of campaigns to reduce avoidable accidents are giving especial attention to the danger resulting from the action of careless workmen in blasting crews who leave caps laying around after blasting operations are completed.

Children playing in fields and along highways in rural districts are attracted to the vicinity of places where men are working, not only to watch the operation of machinery and the discharge of explosives, but also in the hope of picking up articles of interest to them after the workmen have left for the day.

The existence of this danger is not mere conjecture. Records compiled by the Institute of Makers of Explosives show that from April to October, inclusive, blasting cap accidents to children reach large numbers. The cause is clear enough. During this period of the year when children are playing outdoors and roaming over fields and woods, there is only one way in which they can come into possession of blasting caps—they pick them up where careless workmen have left them.

The extent of the danger may be appreciated when we reflect that a blasting cap will blow a hole through a steel plate one-sixteenth of an inch thick, and—when given a chance—a cap will blow a child's hand off.

Safety in blasting operations must not be allowed to stop with safety measures to protect the workmen who handle and use explosives. Avoiding danger to others is fully as important.

Detailed Story of Operating Methods at Giant's Reliance Quarry

Prospecting, Sampling and Analysis—Primary and Secondary Blasting Practice—Loading and Transportation Equipment Required—Produce 30,000 Long Tons Per Month

By S. G. McANALLY
Chief Chemist,[1] Giant Portland Cement Co., Egypt, Pa.

This carefully prepared description of quarrying methods at the Reliance quarry of the Giant Portland Cement Company, Egypt, Pa., carries the operations to the point where the quarry product reaches the crusher.

The next article, comprising the concluding half of this excellent paper, will deal with the crushing, drying, mixing and grinding operations, and detailed cost data will be given.—The Editors.

THIS is one of a series of papers describing mining and crushing methods and costs at cement plant quarries throughout the United States and deals directly with the methods employed and costs obtained at the Reliance quarry of the Giant Portland Cement Co. at Egypt, Pa., although it is more or less descriptive of the methods used throughout the Lehigh Valley cement district. Systems of transportation vary according to local conditions, such as proximity to the mill, or depth of quarry floor with relation to the mill level. Methods of prospecting differ mainly in the type of drills used. Systems of storage, crushing, and grinding vary chiefly in the types of units.

Acknowledgments

Most of the information regarding the early history of the Lehigh cement district was obtained from the History of the Portland Cement Industry of the United States, by Robert W. Lesley, the first president of the Portland Cement Association. The writer is indebted also to Charles Clader, Giant Portland Cement Co. quarry superintendent, for valuable information regarding present and past methods and equipment.

Some information on the geology of the district has been gleaned from Prof. Benjamin L. Miller's report on the limestones of Pennsylvania. Other statements regarding the geology are based on personal observation and on the interpretation of the analyses of samples of rock from numerous test holes drilled over a large area.

Geology

The cement rock in the Reliance quarry belongs to the Jacksonburg formation and is a continuation of a belt that extends from Belvedere, N. J., on the Delaware River, through Stockerton, Bath, and Northampton, to about 10 miles west of the Lehigh River. The belt is only a few miles wide, yet there are about 25 cement plants located on it.

The strata consist of a basal layer of crystalline limestone mixed with dolomite, and an upper layer of argillaceous limestone (cement rock) which comprises most of the formation. The northern boundary of the cement rock can sometimes be determined by an abrupt change in the topography, the line of contact being at the base of the steep slopes which mark the southern margin of the slate belt (Martinsburg formation) which overlies the Jacksonburg limestone. The southern boundary is sometimes marked by a change in slope to the more-soluble underlying high-grade limestone (Beekmantown formation), but the geology is not regular.

In some areas large lenses of high-grade cement rock are embedded in very low-grade material; sometimes the rock is covered by residual clay to a depth of 50 feet. There are several large outcrops of dolomite which are probably overlain with cement rock.

The cement rock is a black slaty stone, intermediate in composition between limestone and slate. The calcium carbonate varies from 55 to 85 per cent. In the developed areas the variation is not so extreme and the rock will average about 75 per cent calcium carbonate. This is the approximate percentage required in the raw mix for the manufacture of portland cement; hence the name "cement rock." The rock is comparatively soft and is laminated, due to its slaty nature. Following is the analysis of the average cement rock from the Reliance quarry:

	Per Cent
Silica	14.80
Iron oxide and alumina	7.20
Calcium carbonate	72.50
Magnesium carbonate	4.10
Water, alkalies, etc.	1.40

The above material must be mixed with some high-grade limestone in order to increase the calcium carbonate content to the desired percentage (about 75 per cent). No workable deposit of high-grade calcium limestone has been discovered in the vicinity of Egypt, and the limestone used at the Giant Portland Cement Co.'s plants is purchased and shipped from Annville, Pa. The cost,

---

Reprinted from U. S. Bureau of Mines Information Circular 6448.

[1] One of the consulting engineers, U. S. Bureau of Mines.

delivered at the mill, is $2.40 per long ton, or about seven times as much as the cost of the cement rock. Therefore it is not economical to work low-grade deposits of the latter.

Reliance Quarry

In some places the cement rock outcrops, but as a rule it is covered by a clay overburden which varies in thickness from 1 to 20 feet. Sometimes the clay extends to greater depth in pockets, chasms, fissures, or wide cracks in the otherwise solid rock. Occasional seams of quartz and soapstone are encountered but not in sufficient quantity or thickness to interfere with the method of quarrying.

Good cement rock is found to a depth of at least 230 feet within the area of the present workings. This area is located in the southeast section of the quarry (see Figure 1). The strata dip in a northwesterly direction at an angle of about 5 deg. Faults are rare and folding occurs only in a few places. The composition of the rock varies considerably in localized sections, but the method of quarrying reduces this variation so that the rock delivered to the mill will average between 70 and 75 per cent calcium carbonate. A plan of the quarry and the track layout is shown in Figure 1. A section of the present face showing location of strata is shown in Figure 2. A longitudinal section of the rock below the floor of the quarry is shown in Figure 3. A view taken from the direction indicated in Figure 1 is shown in Figure 4.

Prospecting

Considerable prospecting has been done on the Reliance and adjacent properties of the company. One gas churn drill is used continually for this purpose. Test holes 6 inches in diameter are drilled to a depth of from 100 to 200 feet. In new properties the holes are first drilled on the corners of a 250-foot square and if the results of the tests indicate that further prospecting is necessary, the spacing is reduced, either for the purpose of tracing high-grade rock when it is encountered or to eliminate any doubts as to the value of the prospected area. Numerous prospect holes have been drilled from the surface of the Reliance quarry to a depth of 230 feet. The quarry floor has been prospected to a depth of 100 feet. As the present face is moved ahead, additional test holes are sunk in the new floor area on 100-foot squares, and the results are tabulated and recorded for future reference.

Loomis No. 4 clipper drill is the type used. The average footage drilled per day of 10 hours is approximately 40 feet. The speed varies with the strata encountered, which consists of clay, cement rock, veins of limestone and quartz, dolomite, and slate. The dolomite is the hardest rock encountered in large masses. The rate of drilling becomes slower with increasing depth. When water is encountered in the drill holes the footage drilled in unit time is much less than the average. The average cost of drilling prospect holes is $0.405 per foot. This cost includes labor (two men to a drill), material and fuel, repair labor, and also covers the time used in moving from one location to another.

Methods of Sampling and Analysis

Samples are taken from each 5 feet of drill hole. Each time the sludge is bailed out the first portion is thrown away and the second fill of the bailer is caught in a water

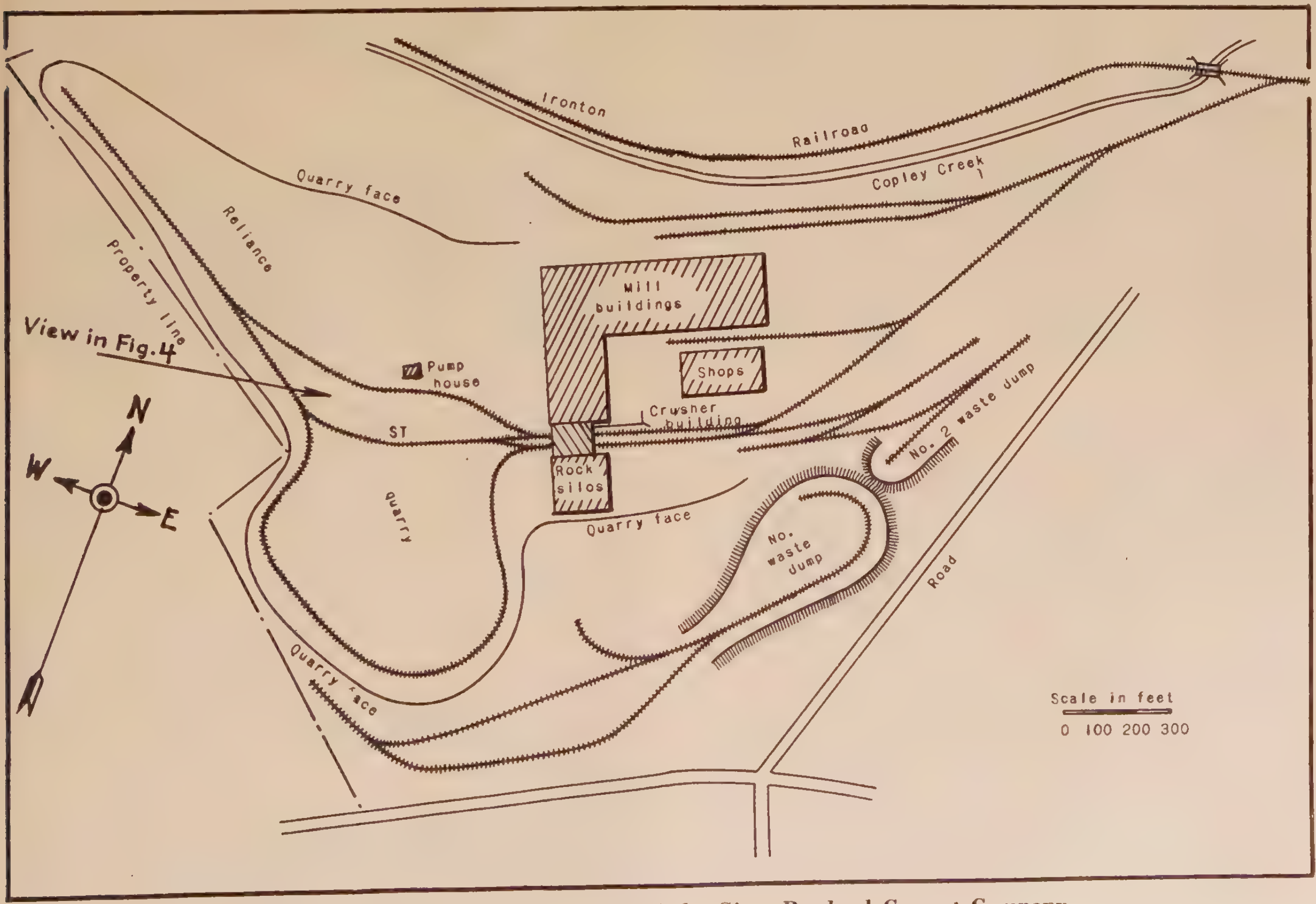


Figure 1. Plan of Reliance quarry of the Giant Portland Cement Company

pail; all other bailings are thrown away. The sample in the pail is washed free from clay, is mixed well, and put into a small tin box or a tobacco can, several of which are provided for the purpose. Each can is marked with the number of the test hole and the depth at which the sample was taken.

Samples are dried and pulverized and a determination for carbonate, in terms of calcium carbonate, is made on each one by the simple and rapid acid-alkali method. After all samples from one hole are tested in the above manner a composite is made of all the samples of that hole. A carbonate determination is made on the composite; the result should agree with the arithmetical average of the individual results within 0.2 per cent. The actual lime in the composite, determined by the potassium permanganate method, is calculated to calcium carbonate. The difference (plus or minus value) between the actual calcium carbonate and the carbonate obtained by the acid-alkali method is added to the individual results so as to obtain the correct values. The composite samples are also analyzed for magnesia.

In using the acid-alkali method for the estimation of calcium carbonate in limestone, cement rock, and cement mixes, it is customary to standardize the acid and the alkali solutions with a standard sample of material approximating the composition of the samples to be tested. If the standard sample contains 42 per cent lime (75 per cent $CaCO_3$) and 2 per cent magnesia, a sample of rock which by this method analyzes say, 70 per cent calcium carbonate, contains the equivalent of 70 per cent $CaCO_3$ and 2 per cent MgO. But if the actual MgO is more than 2 per cent, then the $CaCO_3$ will be less than 70 per cent, and as the percentage of magnesia may vary in different sections and strata of a property, it is necessary to make a determination of the lime in the composite in order to check and make any correction of the acid-alkali determination.

When the acid-alkali result exceeds the actual calcium carbonate content, the difference, especially if considerable, can be attributed to a higher percentage of magnesia than that in the standard sample. This difference multiplied by 0.4 will equal approximately the increase in the percentage of magnesia. Other acid-soluble basic impurities affect the acid-alkali determination, but to a less degree.

Estimation of Tonnage

Based on the analyses, areas are mapped out so that the average calcium-carbonate content of the whole area will exceed 70 per cent. The available tonnage is estimated on the basis of 155 pounds per cubic foot. Due to the fairly regular and solid formation of the rock, especially below the quarry floor, the tonnage can be estimated closely.

Methods of Quarrying

The open-pit method of quarrying has been used from the beginning of operations in the Reliance quarry. The first cut was made at the mill site in order to excavate for the crusher and adjacent buildings. The area extending from the mill to the northwest was the first developed and worked, due, no doubt, to the fact that it had less than 1 foot of overburden. When the good rock in this section became exhausted, or nearly so, the area to the southwest was prospected and developed. The overburden in this area consists of a yellow clay. The amount of clay per thousand tons of cement rock is approximately 100 cubic yards. This estimate applies only to the southwest area.

This heavy clay overburden is removed by stripping with a power shovel and a dragline scraper supplemented with some pick and shovel work. Due to the clay-filled crevices previously mentioned which, in part, can not be stripped by the regular methods with economy and safety, some waste is shot down with the rock. The waste removed in the quarry proper by the power shovels and transported to the No. 2 waste dump amounts to approximately 2 per cent of the rock recovered. A certain amount of waste is unavoidably mixed with the rock going to the mill but it is only harmful in that it requires a larger amount of the expensive limestone to regulate the mix.

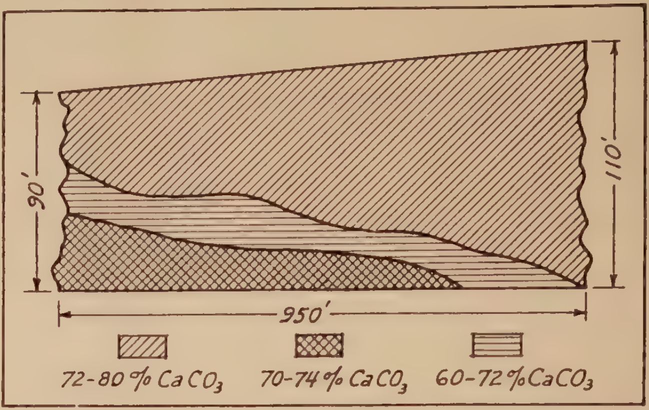


Figure 2. Section of south face of quarry showing composition of strata

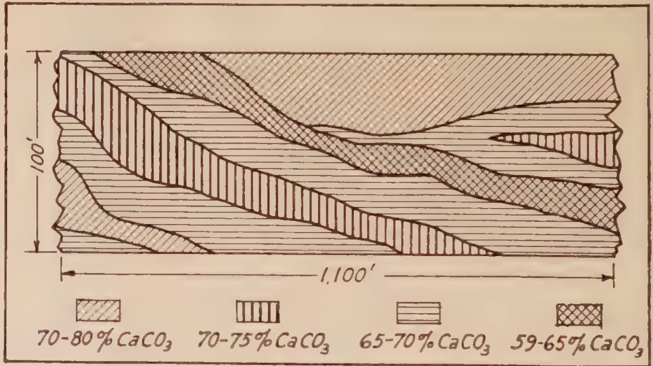


Figure 3. Longitudinal section of rock below the quarry floor

Considering the nature of the overburden and its amount, the fact that 98 per cent of the material shot down can be recovered, that high and long working faces are possible, the open-pit method and the use of power shovels is logical and economical.

Stripping

Stripping operations are carried on between April and October. The first cut is made with a steam shovel with a $\frac{3}{4}$-yard dipper. This is followed later by a steam shovel which has been converted into a dragline scraper and equipped with a ¾-yard scraper bucket. Most of the clay is found in wide chasms and long crevices and the dragline is suitable for removing it. In the narrow lateral crevices which are inaccessible to the scraper bucket several men are employed to dig the clay and shovel it into the path of the bucket. All overburden is removed as far as possible.

The clay is loaded directly into side-dump cars that hold 1¼ cubic yards and are hauled to the No. 1 waste dump by steam locomotives. A train consists of six cars. The dump is located on the slope of a hill. The length of haul from the stripping area to the dump is between 1,500 and 2,000 feet; the grade is less than 2 per cent. The track layout is shown in Figure 1. The gauge is 30 inches and a 24-pound rail is used.

The average amount of overburden removed in 10 hours is 175 cubic yards. This figure applies to the dragline operation in which the stripping is tedious and expensive, due to the awkward position of the clay. The dragline scraper and two locomotives are used at present. The stripping crew consists of 14 men, as follows: 2 men on the dragline, 1 man on each locomotive, 6 pick-and-shovel men to supplement the scraper, and 4 men on the waste dump to empty cars and level off. One foreman has charge of stripping, drilling, and prospecting.

The total cost of stripping over a period of four years amounts to $0.599 per cubic yard. Stripping operations are kept well ahead of drilling, and enough rock to supply the mill for about two years has been stripped.

Mining

In mining, the general plan is to develop long and high faces so as to bring down with one shot sufficient rock to supply the mill for several months. The Reliance mill requirements are between 25,000 and 30,000 long tons per month. The Central mill, when operating, requires about 18,000 tons per month. Both mills are supplied from the Reliance quarry. All the rock is used in the manufacture of cement. Waste inclusions amount to about 3 per cent of the rock. About two-thirds of this can be easily segregated, loaded separately, and transported to the No. 2 waste dump which is located close to the stripping dump but at a lower level on the side of the same hill. The haul to the lower waste dump is too steep to be made directly; it is accomplished by making one long level haul and three short hauls of 4 per cent grade. The total length of haul from the quarry face to the lower waste dump is approximately 3,500 feet.

The quarry face is perpendicular. From the east to the west side the height of the face increases from 85 to 110 feet. A circular face is developed. It is believed that this form of face gives the best blasting results with respect to the amount of explosives used per ton of rock for primary and secondary blasting.

Primary Drilling

Churn drills made by the Loomis Machine Co. are used for the primary drilling (and for prospecting). There are two gasoline drills, one traction and one half-caterpillar, and two steam drills, one traction and one horse-drawn. The gasoline drills are preferred as they are found to be more economical to operate and are more convenient with respect to supplies, such as fuel and water. A horse and cart delivers the coal from the mill to the steam drills, dragline, and to the locomotives. The driller's helper brings the gasoline in 5-gallon cans from the mill. A pipe-line from the mill to the top of the quarry delivers either water or air. The air pressure is 65 pounds. The air is used for operating a jackhammer when it is found necessary to blast some of the rock in order to level the surface or to fill in some of the crevices prior to locating the churn drill. Where the crevices are wide, the churn drill rests on a cribbing made from railroad ties.

Oil-well drill steel 5⅝ inches in diameter is used. Drill bits weigh 250 pounds and are dressed to 6⅛ inches diameter. Drill stems measure 4¼ inches by 20 feet. The bits are dressed in a bit dresser. Casing is used only in clay or loose material.

The average drilling speed is 45 feet per day of 10 hours. When in hard rock, bits have to be changed and dressed oftener so as to maintain a uniform diameter of the hole.

Holes are spaced 15 feet apart, parallel to the face, and carry a 28-foot burden. Where it is impractical, due to extreme irregularities of the top surface, to drill parallel to the face the holes approach or recede from it, depending on the apparent degree of solidity of the rock at that point. Formerly it was the practice to increase the spacing in the more solid rock but this procedure was discontinued as it was found to make the cost of secondary blasting too high. The number of holes drilled for one shot ranges from 35 to 45. The diameter of the holes is 6¼ inches; the depth is governed by the height of the face, which varies from 85 to 110 feet. All holes are drilled 6 feet below the quarry floor.

Drilling starts immediately after each shot is made. Positions of the holes are located by measuring from permanent stakes the exact distances toward the quarry face; this establishes the base line for the row of holes. A record is kept of the location of each set of holes and the position of each hole is plotted on a blue-print of the quarry. Each hole is numbered. Samples are taken every 5 feet and are marked according to the hole number and the depth at which the samples were taken. The samples are treated as described under "Methods of Analysis." They are stored until after the shot is made and the stone used. A composite is made of samples of all holes in the blast, and a complete analysis is made of it.

Primary Blasting

The explosives used for primary blasting are 60 and 40 per cent gelatine dynamites. The cartridges are 5 inches in diameter and 24 inches long. Cordeau is used for detonating the charge. No. 6 detonators and fuse having a speed of 40 seconds per foot are used for firing.

The powder used for primary blasting is not kept in storage but is delivered to the quarry by auto trucks on the day the shot is to be fired. It is distributed to all the holes in proportion to the amounts and the strengths required. The boxes are opened by extra labor (not the loading crew). There are from two to four loading crews of three men each. They fill the holes in rotation and under the supervision of the explosive company's representative, who acts as powderman and who is responsible for the shot.

In loading each hole the cordeau is attached to the bottom stick of powder. As a rule the bottom is loaded with the 60 per cent powder and the top with 40 per cent. The thickness of the burden at different heights also governs the distribution of the different strengths of explosive. When pockets are encountered, that portion of the hole is filled with clay. The holes are loaded to within 20 to 25 feet from the top and the remainder is filled with clay and tamped down.

After all holes are loaded the ground is cleared of powder boxes and other obstructions, a trunk line of cordeau is run from the first to the last hole, and the free end of the line is connected to the detonator and fuse. The fuse is lighted with a match.

All holes are loaded and fired on the same day. Between 10 and 15 minutes are required to load each hole.

The fragmentation desired is dependent on the size of the primary crusher, which is a 48- by 60-inch jaw type. There is no minimum limit, as all the stone is used for making cement.

In the drilling and blasting operations holes have been drilled with 16-foot centers and 24 feet of burden; 18-foot centers and 26 feet of burden; and different strengths of explosives, 30, 40, 50 and 60 per cent have been used under these varied conditions. The most economical results with respect to the total cost of primary and secondary blasting have been obtained by drilling the holes 15-foot centers and carrying a 28-foot burden.

Secondary Drilling and Blasting

Jackhammers are used for drilling the large boulders. The air is delivered from the compressor to the quarry over a 2-in. line. Several 1¼-in. air lines branch out from the main line to different sections, and ¾-in. leads connect the main line to the drills. The air pressure at the drills is between 70 and 80 pounds.

The drill steel is ⅞-in. hexagon stock; 1¼-in. bits are used for 1½-in. diameter holes, and 1¾-in. bits for 2-in. holes. In large boulders in which the depth of the holes exceeds 10 ft., the holes are made 2 in. in diameter; shallower holes are made 1½ in. in diameter. The drilling speed is about 1 ft. in 4 minutes.

The large boulders encountered by the steam shovels are cast to one side and drilled by a crew of two men used for this purpose and for barring down loose boulders, which are also drilled. Holes are drilled to the centers of the boulders. The dynamite used is 1¼-in. diameter 40 per cent gelatin. No. 6 detonators and fuse having a speed of 40 seconds per foot are used for firing. The holes are filled to within 2 in. of the top with the powder, the cap and fuse are attached to the last stick, and the last 2 in. of the hole is filled with clay and tamped well. The fuses are cut to not less than 30 in. and are lighted with a wick.

In primary blasting the shots will average 3.7 tons per pound of explosive; in secondary blasting the ratio is approximately 1 pound of explosive to 44 tons of stone.

Loading the Stone

Two traction-type steam shovels are used for loading the stone. The dippers are 2½-yd. capacity. One is held in reserve. Two shovels are able to load between 180 and 190 long tons per hour; this includes the intermittent stops caused by transportation delays. There are 3 men on each shovel; an engineer, a fireman, and a craneman. Working 8 hours per day and 5 days per week, the mill requirements of from 25,000 to 30,000 long tons per month can be supplied.

Transportation from Quarry to Crusher

Three steam locomotives running on standard gauge 60-pound rail are used to transport the rock to the crusher. The grade to the crusher is practically level. Side-dump cars of 10 tons capacity are used. The load in each car is 7½ long tons. Five cars make up a trainload. The fuel used on the locomotives, shovels, etc., is run-of-mine coal. It is hauled by a horse and cart to the shovels from a storage pile located on the track adjacent to the pump house. The locomotives obtain their coal from the same source. The water for the boilers is treated by the lime-soda process.

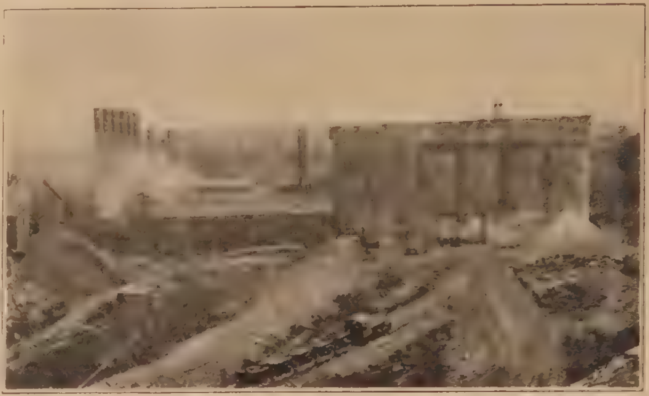


Figure 4. View of quarry and crusher building and rock storage silos

From the crusher to the quarry face the locomotives follow the horseshoe track around the face and make the return trip with the load over the straight piece of track (ST, Figure 1). The cars receive half of their load from the shovel nearer to the mill, and the load is completed by the further shovel. This loading system helps to mix the rock and reduces the variation in the composition. The haul to the crusher is about 1,200 ft.

Quarry Crew

The total quarry crew (exclusive of the men on primary drilling, blasting, and stripping) consists of 17 men; 3 on each shovel, 1 man on each locomotive, 2 powdermen for secondary drilling and blasting and for barring down; 2 pitmen, 2 track repair men, 1 man at the crusher to dump cars, and 1 foreman.

An illustrated description of the crushing plant and crushing operations and detailed crushing and quarrying costs will be given in the next article.

(To be concluded.)

New French Cement Firm Formed

A new cement and lime firm, the Societe Anonyme des Chaux et Ciments Desfontaines, has been formed in Paris, France, with a capital of 1,200,000 francs to operate a plant at Falaises to produce white cement, lime and other cement products.

Exhibit of Cement Manufacture to Build Up Public Interest

Century of Progress Exposition Offers Chance to Acquaint Public With Complex Processes Involved—Quarter-Size Plant Suggested—Rules for Exhibitors

WITH an expected minimum attendance of fifty million visitors, and a probable attendance greatly in excess of that number, the Century of Progress Exposition to be held in Chicago from June 1 to November 1, 1933, offers the portland cement industry an opportunity to familiarize the more intelligent strata of the general public with the essential processes in the manufacture of cement.

Purpose and Nature of Exhibits

The purpose of the Century of Progress Exposition is that of portraying to the people of the world the manner in which industry has made use of scientific discoveries and inventions for the improvement of living conditions during the past century.

Two types of applied science displays are proposed, in addition to the basic science displays. One form of exhibit will be historical, showing the progress of whole industries by successive stages of development. Attending these displays will be corporation displays showing how the industry contributes to human needs and wants.

Wherever exhibits can be shown in action, that will be the display method employed. Visitors with the vision to see and the intelligence to comprehend need not saunter aimlessly through miles of confusing displays. On the contrary, they may select some subject or product in which they have a permanent interest, go to the appropriate building, start where science starts, see how science is lifted out of pure knowledge and put to work, go along with the applied science as it creates and extends and improves the industrial arts, and follow all the processes of development until the finished product is created.

Where Cement Fits Into the Picture

There are few basic building materials with which the general public comes into contact in as many different ways as with portland cement. Every man who owns his home has at some time used cement in making something out of concrete. Children see cement in use as they watch a concrete mixer at work. All are familiar with the use of cement in concrete roads and bridges and buildings. But who, aside from those actually engaged in the industry, knows how cement is made? What intelligent person would not be benefited by such knowledge?

It is altogether probable that the general public is interested in the manufacture of portland cement to a much greater extent than most cement manufacturers realize. It is probable, also, that a more widely disseminated knowledge of the processes and problems involved in the manufacture of cement would result in a better appreciation of the product itself.

With the foregoing ideas in mind, the managers of the Mineral Industries Section and the Civil Engineering Section, respectively, discussed with a representative of the Cement Mill Edition of CONCRETE the manner in which the portland cement industry might exhibit the manufacture of cement to the best advantage and the most benefit to exhibitors and visitors alike.

The purpose of the exhibit could be realized to the fullest extent, these officials suggested, by means of an actual manufacturing plant built to a quarter-size scale, or possibly one-eighth of full size. This miniature plant should be engaged in the actual manufacture of cement, so that interested visitors may start with the freshly quarried raw material and follow the processes step by step to the grinding and packing of the finished product. Space can be made available for such an exhibit.

Rules and Regulations for Exhibitors

Exhibit spaces will, in general, be in units 20 ft. square, or in multiples of this unit.

Applications for exhibit space shall be made in triplicate, on forms which may be obtained by addressing Major Wayne O. Axtell, in charge of the Mineral Industries Section, Century of Progress, Administration Building, Burnham Park, Chicago, Ill. Preference in allotment of space will be given in the order of receipt of applications.

An application shall include a general description of the nature of the proposed exhibit, and it shall be followed within a reasonable time by drawings on a uniform scale of ¼ inch to the foot. The drawings shall include a plan showing the general layout of the proposed exhibit, a front elevation, a side elevation, and, if practicable, a perspective drawing of the proposed installation.

Exhibitors desiring to sell the product produced at the exhibit installation must make a statement to this effect on the application, and must obtain a separate permit for this privilege.

No charge will be made for ground space to be occupied by any special building to be erected by an exhibitor, at his own expense.

An exhibitor requiring more than 8,000 sq. ft. of floor space should take up the question of space allotment with the Century of Progress authorities at the earliest possible date.

A special permit must be obtained for machinery or other appliances in motion; but no machinery or appliances emitting smoke or fumes which might be injurious to health, or which might cause inconvenience or annoyance to visitors or to other exhibitors, will be permitted.

Free admission credentials will be issued to exhibitors and their agents and employees, and to contractors and their employees engaged in doing construction work for exhibitors.

Utilities Available

Water, sewerage and alternating current electricity will be available at most points within the exposition grounds by comparatively short connections. Gas connections in most parts of the grounds will be long and expensive. Compressed air, steam and mechanical connections from shafts will not be available. Connections to the utilities available will be made at the expense of the exhibitor.

For private exhibitors the rental charge for the duration of the exposition will be at the basic rate of $10 per sq. ft. for space in any of the general exhibit buildings erected at the expense of the Century of Progress, and $2.50 per sq. ft. for outdoor open exhibit space. A discount of 10 per cent will be allowed exhibitors whose applications are received prior to December 31, 1931. Other discounts, as well as the times at which payments are due (in four installments), are given in detail in the complete Rules and Regulations for Exhibitors, a copy of which should be obtained at the time application blanks are requested.

Time for Filing Applications

Applications for space in special exhibit buildings to be erected at the expense of the exhibitor must be on file not later than June 1, 1932. Beginning of new construction work for such purposes will not be permitted after August 1, 1932.

Application for outdoor exhibit space not involving the construction of buildings or outdoor structures or works will be received up to December 31, 1932.

The expiration for receiving applications for space in any of the general exhibit buildings erected at the expense of the Century of Progress will be July 1, 1932, where the exhibit installation requires special foundations; or September 1, 1932, where the installation, maintenance and operation of the exhibit requires special connections for water, sewerage, electricity or other utilities; or November 1, 1932, for all other exhibits.

Complete Rules and Regulations

Only the high points in the rules and regulations are given here. A 13-page publication, mentioned previously, entitled "Rules and Regulations for Exhibitors," contains detailed information on all matters affecting the installation and operation of exhibits.

Increase in Canadian Cement Exports Over March, 1930

Canadian exports of cement during March, 1931, were larger in volume than those for the preceding month or for March, 1930. In March, 1931, the total exports were 8,991 barrels, compared with 8,415 barrels in March, 1930.

Cement exports during the first three months of 1931, however, were only about two-thirds of the volume shipped during the same period in 1930.

During February Canadian production of cement came to 409,010 barrels, an increase over the preceding month, and also over the 295,810 barrels produced in February, 1930, according to Consul Julian F. Harrington.

George Bartlett Joins Staff of Cement Association

The appointment of George S. Bartlett of Chicago as assistant to the chairman of the board of the Portland Cement Association, has been announced, to take effect immediately.

Announcement was also made during May that steps are being taken to establish a medal in honor of George Bartlett "to perpetuate the friendliness and helpfulness which he has brought into his work in the highway field." The medal will be awarded annually to an engineer, highway official, contractor or manufacturer who has made a notable contribution to the highway art or the highway industry.

A committee, comprising 61 of his friends, has been organized. Checks are to be sent to E. J. Mehren, 520 North Michigan Avenue, Chicago.

Mr. Bartlett has been intimately identified with the good roads movement in a number of states for twenty years. He is generally known as one of the pioneers in securing the introduction of concrete for highway and street paving and an important figure in the activities of the Portland Cement Association almost since its inception.

Mr. Bartlett has had a long experience and retains a wide acquaintance in the cement and related industries. He was associated with several of the earlier cement companies in an executive capacity and for the past sixteen years has been with the Universal Atlas Cement Company as a special representative. He was retired recently under the 70-year retirement rule of the United States Steel Corporation, of which Universal Atlas is a subsidiary.

Mr. Bartlett's many old friends will be glad to learn that he has joined the forces headquartering at "33 West Grand."

Earnings of International Domestic Subsidiaries Increase

The International Cement Corporation reports for the quarter ended March 31, 1931, net income of $410,909 after depreciation, federal taxes, etc., equivalent to 65 cents a share on 636,085 shares of no-par common stock. This compares with $841,480 or $1.34 a share on 628,883 shares in the first quarter of 1930.

Earnings of the domestic subsidiaries were greater than for the first quarter of 1930. The net decline in earnings, according to Holger Struckmann, president, as compared to last year is due to the extremely depressed conditions in Cuba and to increased exchange losses in South American countries.

Swedish Exports to South American Countries Continue

Output of cement in February, 1931, was practically the same as for January of this year, Swedish cement companies report. Preliminary official statistics show that 41,879 barrels were exported during February, compared with 46,212 barrels in January and 37,834 barrels in February, 1930. Dealers report that South America continues to be the principal market for Swedish cement, Brazil and Argentina receiving the largest quantities.

Accidents From Use of Powdered Coal Can Be Avoided

Controlling the Coal Storage—How Coal Plant Accidents Occur—Removing Hazards by Careful House-Cleaning — Using Live Steam to Extinguish Coal House Fires

By D. A. DAVIS
Power Engineer, Northwestern States Portland Cement Co., Mason City, Iowa

PULVERIZED coal in bulk is not explosive. It becomes dangerous only when stirred up into a cloud with the proper proportion of air and brought in contact with an open flame or with a body having sufficient temperature to ignite it.

Fineness is the physical characteristic which governs explosibility. In general, any coal retained on a 20-mesh screen does not enter into the propagation of an explosion. Powdered fuel, however, is not inherently dangerous. It becomes so only when improperly handled. To eliminate these dangers, we must inform ourselves as to proper methods of handling.

This short article will point out some common hazards from the use of pulverized fuel, and some remedies for them.

An Unsuspected Danger

In the buildings of an industrial plant a rather unsuspected danger lurks in the dust from some types of heating furnaces, which settles on girders, beams, electric cables, switchboards and any other place upon which it can lodge. In a number of cases much of this supply of dust is the result of furnaces being inadequate in size, allowing much unburned fuel to blow through the combustion chamber into the outer air. The danger in this condition is often fostered further by poor house-cleaning methods.

A sudden jar may start this dust tumbling from its perch, and a flame may ignite it with an explosive result, depending upon the amount of suspended dust. This condition can occur and be disastrous on the outside as well as on the inside of a building.

It has been the writer's experience to see a newly installed powdered fuel outfit put into operation in connection with a boiler, without first taking the precaution of opening all the inspection doors about the setting. After one or two explosions within the furnace, all the doors were open and some were opened so forcefully as to tear them from their hinges. In the initial starting up of powdered fuel equipment, it is well to provide sufficient avenues of escape for suddenly expanded gases.

Dryers a Source of Trouble

The man in charge of a dryer has a particular responsibility in seeing that overheating does not occur. Dryers should be equipped with by-passes, so that the gases of combustion can not pass through the drum when the dryers are not in operation.

Next to the dryer, one of the most prolific sources of trouble is the large main used for circulation of a mixture of coal dust and air in some distribution systems.

Irregularities in air pressure due to variations in flow may cause secondary air to enter, carrying with it hot particles from the furnace.

Coal Storage

Because bituminous coal tends to absorb oxygen rapidly and thereby reach a stage of combustion, the storage of dried or pulverized coal should be limited to as small an amount as possible. It is commendable to regulate the supply so that none is left in storage, if the plant is to be shut down for more than four hours. The critical point at which oxidation of coal begins to increase rapidly seems to be at about 150 deg. F.; from that point the temperature increases rapidly to the ignition point.

Bins should, of course, be tightly covered and all manholes and other openings should be airtight. It is well to vent the bins to the outside air for release of pressure. This vent should have a valve that can be closed when the bin is not in operation, but still contains an appreciable amount of fuel.

In this manner, much danger from spontaneous combustion is eliminated. All joints should be welded, and fuel is less likely to cake and adhere in corners that are well rounded.

It seems wise to remove pulverized coal storage bins from immediately over furnaces, and preferably to construct them outside the main building. Where buildings are situated so that the entrance of sparks through windows, doors, or ventilators can not be eliminated, all these openings should be well screened.

Fire Control

About the only method of controlling a fire in a pulverized coal bin is to cut off the feed to the furnace and empty the bin as quickly as possible, using care to avoid raising a dust cloud that might be ignited. In at least two instances, it has proved effective to have all bin openings equipped with airtight valves which were closed, preventing entrance of all air, thereby prohibiting combustion. Where dust explosions occur in buildings that favor building up of pressure, very high pressures may be obtained.

In a Bureau of Mines experiment, pressures as high as 119 lb. per sq. in. were developed in 750 feet, within 2.2 seconds. The advantage of light building construction is exemplified in a number of cases. Windows near the ground should not be glazed with wire glass, as they may

---

Paper read before the Regional Safety Conference, Davenport, Iowa, April 2, 1931.

be the only means of escape for men in an emergency.

Manufacturers of explosives often provide floor windows with safety catches so hung that, in emergency, they may be swung open, permitting accessible openings for escape.

How to Avoid Some Dangers

The remedy for coal dust hazards is good housekeeping. The plant must be kept clean and free from dust accumulations. The use of vacuum cleaning machinery is to be commended. Removing the dust by compressed air is distinctly dangerous.

Whitewashing the plant throughout is of value in improving visibility of accumulations, and facilitates housecleaning. There is also an economic aspect to the question of cleanliness. It is estimated that in many plants as high as 2½ per cent of the coal handled is lost in dust. In plants using any considerable quantity of coal, a loss of this magnitude would, if recovered, go a long way toward defraying the cost of an effort to make them dust-proof.

Plants can be made dust-proof. The writer has been in plants pulverizing 150 to 500 tons per day, where but little dust was visible.

How Coal Plant Accidents Occur

The first six of the following descriptions of accidents and their causes were compiled in the accident prevention bureau of the Portland Cement Association:

1. Two repairmen were about to repair a coal dust elevator. One man went into the stack and was followed by the second man carrying a lighted torch. The second man hit the elevator chain with a hammer, intending, as a joke, to knock the dust on the man who preceded him. The torch ignited the dust, an explosion occurred, and both men were blown out of the elevator stack. The first man died soon after at the hospital, but the second man recovered. In this case there was no doubt as to the cause of the explosion. In the following year, at the same plant, an explosion took place in the coal house whereby two men were burned so badly that they died in the hospital. These men were the only ones in the building and no information was ever obtained as to what might have caused the explosion.

2. About three years ago we had a flight of wooden steps in our coal plant connecting the floor with runways and platforms 30 or 40 feet above the floor. It was our custom, twice each month, to shut down all of the machinery and to turn the hose on the fire in the furnace under the dryer, and to put a number of men at work cleaning down all of the coal dust which had accumulated on these steps and runways during the preceding 15 days, and after it had gathered on the concrete floor, to shovel it into wheelbarrows and take it outdoors. While ten men were at this work and the air was thoroughly impregnated with coal dust, the dust became ignited. The result was that nine of the ten men were burned to death. All but one of the nine got away from the scene of the combustion of the coal dust, the majority of them with only small patches of fire on their clothing; but they became panic stricken, and did not stop running until the flames had spread to all parts of their dust impregnated clothing, and they had become human torches and finally dropped exhausted to the ground. Although the entire coal room was undoubtedly filled with flame, there was no explosion and the window panes were not even cracked and nothing in the room was disturbed.

3. The coal in a coal dryer ignited, and in passing out of the dryer and falling into the elevator boot it ignited the coal dust. The explosion blew off the elevator doors and flames enveloped the dryer as the explosion shook the dust off of all resting places, the metal stack became red hot, and would have fallen had it not been securely held in position by structural steel. A damper, held open by means of a cord, swung shut as soon as the cord burned off, shut off the air and saved the dryer and stack.

4. A loose elevator in a coal room, striking the sides of the elevator casing, attracted the attention of the operator. Shutting down the moving machinery, he opened up the elevator; seeing the elevator chain was loose, he went to the kiln room and borrowed a torch. Setting the lighted torch in one of the buckets, he grabbed both chains with his hands, swinging them to see how loose they were. He used the light to see if the chains were off the boot traction wheel. A cloud of fine dust was jarred loose inside of the elevator. Falling, it came in contact with the lighted torch. A violent explosion took place, burning the man fearfully on his face, neck, hands and arms.

5. A laborer sent to clean off a flat surface that was covered with 3 or 4 inches of coal dust threw a shovelful out of the window into a wheelbarrow that had fire in it, and an explosion immediately took place.

6. A broken screw conveyor necessitated the emptying of a pulverized coal storage tank in the kiln room. The men became careless in handling the dust, allowing some to run into the elevator pit, where it came in contact with red hot clinker. A bad explosion took place immediately, burning one man badly.

7. I know of only two accidents that occurred in my experience of fifteen years around pulverized coal. One was due to a workman using a torch in a pulverized coal elevator. An explosion followed. The other was due to a large blast in the quarry, which was a short distance away from the coal mill. The vibration shook the coal dust down. Unfortunately, at the time, the fire door of the coal dryer was open.

8. Back in 1903 we had a disastrous explosion in our coal grinding house, which caused the death of 12 men and serious injuries to others. The accident occurred in a building which was about 80 feet long, 60 feet wide and 50 feet high. There was an elevator in one end of the building enclosed in an iron casing. This elevator handled the crushed coal from our grinding rolls and lifted it to the top of the building, where it was distributed to our air separators. By some means which we have never been able to discover, a fire started in the boot of the elevator. There was not much fire and the men attempted to put it out by throwing pulverized stone dust into the pit of the elevator, and also some water. After a time it was thought the fire was out and the elevator was started up. Immediately thereafter an explosion took place, apparently starting in the elevator and quickly extending through the entire building. The force of the explosion was so great that it ripped off a large portion of the corrugated iron sheeting from the building, throwing some of it 200 feet. There was a scraper conveyor connecting this building to a fine coal storage building

approximately 600 feet long, and the fire followed the full length of this conveyor house, which is about 6 feet square, and set on fire the fine coal which was stored in the bin in this building.

Reconstructing a Coal House

In reconstructing the coal plant, we built a frame building and covered it with corrugated iron which is placed on the inside of the frame so as to allow no places for coal dust to settle. We also installed steam coils and air blowers for drying, instead of using direct heat as heretofore. We also use great precautions to keep all coal dust swept up clean at all times and do not permit fire or smoking in or around these buildings. The only lights allowed are incandescent lights. The top of the building is full of openings, so that any gas may freely escape from all conveyors and elevators handling the pulverized coal. Furthermore, all bins and conveyor boxes have pipes on them at various points which will allow any gas to escape to the atmosphere. We also have perforated pipes running through the conveyor system through which live steam can be introduced in case the coal should get on fire. We have had occasion to use the live steam two or three times since it has been installed, and find it very effective.

Olympic Announces Big Increase in Volume of Business

Presiding at the twentieth annual meeting of the Olympic Portland Cement Company, Ltd., recently held in London, England, John Lawson, the chairman, referred to the severe loss suffered by the undertaking through the death during the year of A. B. Williamson, late chairman of the board. Mr. Williamson had many years' practical experience on the Pacific Coast, where the firm's works are located.

After allowing for depreciation, the firm's net profit for 1930 is £41,519 ($207,595). From this a dividend of 6 per cent is being paid and £29,874 ($149,370) is being carried forward.

"The volume of business was satisfactory in 1930," said Mr. Lawson, "and there was nearly 70 per cent increase in deliveries compared with last year. Part of this increase was accounted for by deliveries of cement against an old contract. While the quantity delivered showed a substantial increase the net trading profit is only about the same as in the previous year, due to the low prices at which many contracts had to be accepted.

"In our territory, four firms compete for business which two could fill, and the consequence is that a good deal of unremunerative business is undertaken. I regret to say there is as yet no sign of improvement. Our company was fortunate in being in a position to manufacture cement at a cost considerably lower than at any previous period of its history. Benefit was also derived during the year from the excellent quality of the limerock used and from the lower operating costs of the new crusher and handling installations. The facilities which we have in our new silos have enabled us to effect considerable economies in delivering direct to bulk cars. Labor conditions were satisfactory throughout the year and have been reduced this March by 10 per cent on the rates ruling last year. The property has been maintained in good condition."

West African Demand for Cement Increases

With the exception of a small quantity of limestone quarried in Senegal and French Soudan, practically all construction material used in the western part of Africa must be imported from outside sources.

The rapid expansion of construction activities of all sorts under way during the last few years in the French colonies of Africa is responsible for an ever-increasing demand for certain building materials, and in particular cement and lime.

Statistics of importations for 1923 mention only 16,000 tons of cement, while in 1926 this arrived at nearly 31,000 tons and in 1928 it passed the 42,000-ton mark. Public and private construction projects already under way promise to boost this figure to a much higher level.

It is in Senegal that the building boom is the most active and the consumption of cement the most important among the French African settlements. This country during 1928 employed 22,013 tons, or 52 per cent of the 42,107 tons of cement imported into French Western Africa. A small portion of this was used in French Soudan.

The Ivory Coast employed 11,058 tons or 26 per cent; Dahomey was third with 4,578 tons, while Soudan and Guinea used 2,185 and 2,143 tons. Importations into Mauritania, by way of Port-Etienne, were only 40 tons.

The cements imported into French Western Africa come principally from France, which in 1928 furnished three-fifths, or 25,584 tons. Belgian cements, which in 1923 amounted to 22 per cent of the total imported, in 1928 had jumped to 32 per cent, or 13,532 tons. Italian cements also strengthened their foothold, 1928 giving them a total of 2,293 tons. The following is a condensed report of cement importations for 1928:

	Tons	Francs
France	25,584	7,726,934
Belgium	13,532	4,286,342
Italy	2,293	687,954
England	133	39,915
Czechoslovakia	133	39,798
United States	32	9,750
Other countries	310	92,795

April Cut Brings Cement Price to $1.00 a Barrel

With quotations at the lowest point in 15 years, cement east of the Rocky Mountains is being sold at prices averaging about $1.00 a barrel. The most recent cut, of 20 cents, to go into effect was that on April 21.

Chicago prices at the mill are around $1.10.

"Chemical Reactions in the Setting of Cement"

Figure 17, in the article of the above title, published in the May issue, appeared without vertical units. They are the same as those in Figure 16, printed on the opposite page.

Properly, Figure 17 belongs below Figure 16.

Cement Quarries Make Notable Record in Safety Movement

Forty Plants Without Lost-Time Accident in Quarry Operations in 1930—Special Honors to Crescent

The remarkable growth of the safety movement in the cement company quarrying and mining departments is again demonstrated by the large number of cement company quarries and mines which have made notable records of long-time operations without accidents.

Many Cement Companies Win Awards

This fact is brought forward in the awards just announced as having been made in the National Safety Competition for 1930, conducted annually by the United States Bureau of Mines, Department of Commerce.

In letters addressed to the companies receiving trophies and to those given honorable mention, Scott Turner, director of the Bureau of Mines, states that an annually increasing number of companies are succeeding in operating their properties with unusually favorable records in the prevention of accidents. The National Safety Competition, he stated, is proving a very effective safety movement largely because its competitive features have a strong appeal both to companies and their employes.

More than 300 large operations participated in the competition during 1930. Seventy-two of these went through the year without a single lost-time accident.

Crescent's Wampum Mine Wins Honorable Mention

Contestants were divided into five groups, four of them comprising underground operations, including anthracite, bituminous coal, metallic ore, and nonmetallic mineral, and the fifth including quarries or open-cut mines. Honorable mention in the fourth group was given to the Wampum limestone mine of the Crescent Portland Cement Company, Wampum, Pa., which worked 100,687 man-hours without a lost-time accident.

Forty Cement Quarries Without Lost-Time

In the fifth group, including quarries and open-cut mines, the following cement company quarries, which during 1930 operated the number of man-hours indicated, went through the year without a lost-time accident:

LaSalle limestone quarry, Marquette Cement Mfg. Co., LaSalle, Ill., 296,997 man-hours.

Cape Girardeau limestone quarry, Marquette Cement Mfg. Co., Cape Girardeau, Mo., 224,514.

Ormrod cement rock quarry, Lehigh Portland Cement Co., Ormrod, Pa., 164,193.

Mason City limestone quarry, Lehigh Portland Cement Co., Mason City, Ia., 158,814.

Fogelsville limestone quarry, Lehigh Portland Cement Co., Fogelsville, Pa., 145,790.

Nos. 5 and 6 limestone quarries, North American Cement Corp., Martinsburg, W. Va., 141,706.

Chanute limestone quarry, Ash Grove Lime and Portland Cement Co., Chanute, Kansas, 133,993.

Petoskey limestone quarry, Petoskey Portland Cement Co., Petoskey, Mich., 132,725.

Dewey limestone quarry, Dewey Portland Cement Co., Dewey, Okla., 126,401.

No. 3 limestone quarry, Pennsylvania-Dixie Cement Corp., Richard City, Tenn., 118,089.

Hercules cement rock quarry, Hercules Cement Corp., Stockertown, Pa., 100,611.

Birmingham limestone quarry, Lehigh Portland Cement Co., Tarrant City, Ala., 100,320.

Greencastle limestone quarry, Lone Star Cement Co., Indiana, Inc., Greencastle, Ind., 99,712.

Clinchfield limestone quarry, Pennsylvania-Dixie Cement Corp., Clinchfield, Ga., 99,423.

Security limestone quarry, North American Cement Corp., Security, Md., 98,048.

El Paso limestone and shale quarry, Southwestern Portland Cement Co., El Paso, Texas, 95,748.

Fordwick limestone quarry, Lehigh Portland Cement Co., Fordwick, Va., 94,560.

Cement Mill limestone quarry, Lawrence Portland Cement Co., Thomaston, Me., 91,842.

No. 4 cement rock quarry, Alpha Portland Cement Co., Martins Creek, Pa., 87,339.

Nazareth cement rock quarry, Nazareth Cement Co., Nazareth, Pa., 85,224.

Sandt's Eddy cement rock quarry, Lehigh Portland Cement Co., Sandt's Eddy, Pa., 81,795.

Dallas limestone quarry, Trinity Portland Cement Co., Dallas, Texas, 75,362.

LaSalle limestone quarry, Alpha Portland Cement Co., LaSalle, Ill., 74,844.

Iola limestone quarry, Lehigh Portland Cement Co., Iola, Kansas, 73,728.

Bonneville cement rock quarry No. 1, Lawrence Portland Cement Co., Northampton, Pa., 73,431.

Mitchell limestone quarry, Lehigh Portland Cement Co., Mitchell, Ind., 69,536.

Catskill limestone quarry, Alpha Portland Cement Co., Cementon, N. Y., 62,245.

Dixon limestone quarry, Medusa Portland Cement Co., Dixon, Ill., 59,881.

Concrete limestone quarry, Superior Portland Cement Co., Inc., Concrete, Wash., 58,972.

Oglesby limestone quarry, Lehigh Portland Cement Co., Oglesby, Ill., 54,312.

No. 7 limestone and shale quarry, Pennsylvania-Dixie Cement Corp., Portland Point, N. Y., 52,610.

Alpha limestone quarry, Alpha Portland Cement Co., Alpha, Mo., 47,262.

No. 4 cement rock quarry, Pennsylvania-Dixie Cement Corp., Nazareth, Pa., 45,916.

Mildred limestone quarry, Consolidated Cement Corp., Mildred, Kansas, 45,600.

Howes Cave limestone quarry, North American Cement Corp., Howes Cave, N. Y., 44,530.

New Castle limestone quarry, Lehigh Portland Cement Co., New Castle, Pa., 41,580.

Trident limestone quarry, Three Forks Portland Cement Co., Trident, Mont., 37,141.

Bonner Springs limestone and shale quarry, Lone Star Cement Co. (Kansas), Bonner Springs, Kansas, 34,134.

Medusa limestone quarry, Medusa Portland Cement Co., York, Pa., 31,728.

Fredonia limestone quarry, Consolidated Cement Corp., Fredonia, Kansas, 30,114.

Alabama Produces All Materials for Making and Shipping Cement

Col. Henry A. Reninger, of Philadelphia, manager of the safety and welfare department of the Lehigh Portland Cement Company, and past president of the National Safety Council, in an interview in the *Montgomery* (Ala.) *Advertiser*, has called attention to the fact that Alabama is the only one of the states which has within its borders a supply, provided by nature, of all the elements entering into the manufacture and shipment of portland cement.

These elements include limestone and shale. In addition, gypsum in small quantities is also mined in the state, and there is an abundance of high-grade coal.

With Alabama raising its own cotton, doing its own ginning, spinning of the yarn, weaving of the cloth and manufacturing cement bags, it is the only state producing practically everything necessary for the manufacture and shipment of cement.

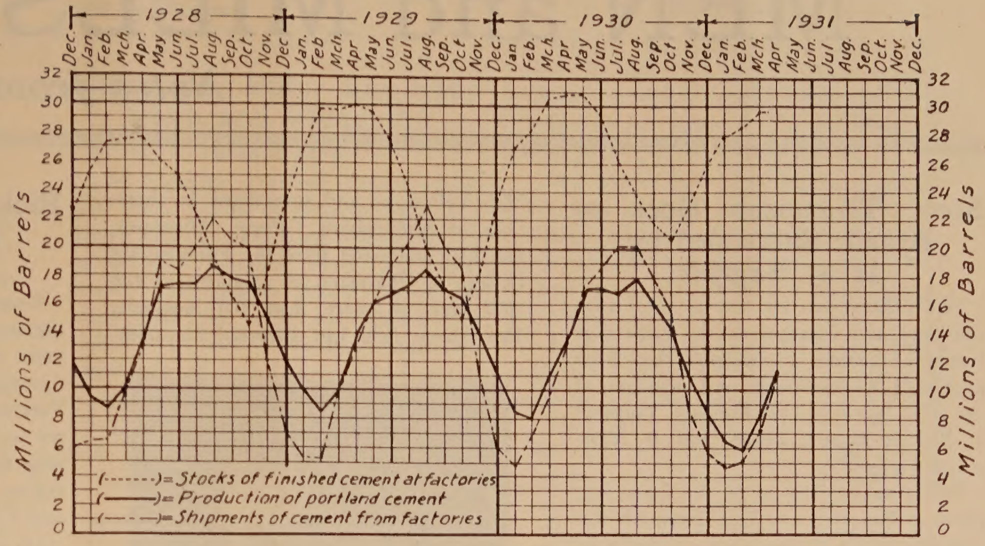
Cement Statistics for April

South Atlantic States Show Increase in Production and Continue Shipment Gains Over 1930

Relation of Production to Capacity

(Figures represent per cent)

	The Month	The Twelve Months
April, 1931	52.1	57.7
April, 1930	**64.0**	**66.0**
March, 1931	36.9	58.6
February, 1931	29.4	59.7
January, 1931	29.5	60.6



	1930	1931	Increase or Decrease, %
Production, April	**13,521,000**	11,245,000	—16.8
Shipments, April	**13,340,000**	11,184,000	—16.2
Stocks at end of month	**30,867,000**	29,736,000	—3.7

	1930	1931	Increase or Decrease, %
Total production for year	**41,406,000**	32,005,000	—29
Total shipments for year	**34,133,000**	28,142,000	—21.3
No. of plants reporting	165	165	......

Production, Shipments, and Stocks of Finished Portland Cement, by Districts, in April, 1930 and 1931, and Stocks in March, 1931

District	Production—April 1930	Production—April 1931	Shipments—April 1930	Shipments—April 1931	Stocks at end of month 1930	Stocks at end of month 1931	Stocks at at end of March, 1931*
Eastern Pa., N. J., and Md.	**3,067,000**	2,691,000	**3,127,000**	2,587,000	**7,037,000**	6,725,000	6,622,000
New York and Maine	**999,000**	832,000	**839,000**	769,000	1,862,000	**2,076,000**	2,013,000
Ohio, Western Pa., and W. Va.	**1,458,000**	829,000	**1,375,000**	919,000	**3,965,000**	3,476,000	3,565,000
Michigan	**562,000**	524,000	**702,000**	529,000	2,595,000	2,595,000	2,600,000
Wis., Ill., Ind., and Ky.	**1,366,000**	1,231,000	**1,265,000**	1,260,000	**4,691,000**	4,208,000	4,237,000
Va., Tenn., Ala., Ga., Fla., and La.	1,262,000	**1,268,000**	1,239,000	**1,343,000**	**1,751,000**	1,639,000	1,714,000
Eastern Mo., Ia., Minn., and S. Dak.	**1,415,000**	1,261,000	**1,230,000**	1,029,000	4,049,000	**4,064,000**	3,833,000
W. Mo., Nebr., Kans., Okla. and Ark.	**1,160,000**	674,000	**1,264,000**	942,000	1,837,000	**1,928,000**	2,196,000
Texas	**757,000**	585,000	**776,000**	581,000	**825,000**	777,000	773,000
Colo., Mont., Utah, Wyo. and Idaho	**286,000**	233,000	**262,000**	184,000	540,000	**601,000**	552,000
California	**838,000**	793,000	**921,000**	733,000	**1,130,000**	1,058,000	998,000
Oregon and Washington	**351,000**	324,000	**340,000**	308,000	585,000	**589,000**	573,000
	13,521,000	11,245,000	**13,340,000**	11,184,000	**30,867,000**	29,736,000	29,676,000

Production, Shipments, and Stocks of Finished Portland Cement, by Months, in 1930 and 1931

Month	—Production— 1930	—Production— 1931	—Shipments— 1930	—Shipments— 1931	Stocks at end of month 1930	Stocks at end of month 1931
January	**8,498,000**	6,595,000	**4,955,000**	4,692,000	27,081,000	**27,759,000**
February	**8,162,000**	5,920,000	**7,012,000**	5,074,000	28,249,000	***28,612,000**
March	**11,225,000**	*8,245,000	**8,826,000**	*7,192,000	**30,648,000**	*29,676,000
April	**13,521,000**	11,245,000	**13,340,000**	11,184,000	**30,867,000**	29,736,000
May	17,249,000	....	17,224,000	....	30,891,000	....
June	17,239,000	....	18,781,000	....	29,364,000	....
July	17,078,000	....	20,153,000	....	26,289,000	....
August	17,821,000	....	20,299,000	....	23,824,000	....
September	16,124,000	....	18,083,000	....	21,889,000	....
October	14,410,000	....	15,599,000	....	20,697,000	....
November	11,098,000	....	8,784,000	....	23,056,000	....
December	8,480,000	....	5,688,000	....	25,883,000	....
	160,905,000	....	158,744,000	....	....	....

Blacker type indicates larger of two figures.

*Revised.

MEN and MILLS

Notes from the Field

Scott Thompson Goes to Brazil; Succeeded by H. A. Sawyer

Scott Thompson, for several years vice-president and manager of the Lone Star Cement Company (Louisiana), has been appointed vice-president and manager of the Cia Nacional de Cimento Portland at Rio de Janeiro, Brazil, also an International plant.

Before taking charge of the Lone Star plant at New Orleans, Mr. Thompson was manager of the Cuban plant of the International, and prior to that he had similar connections with one of the South American plants of the same organization.

Mr. Thompson is succeeded at New Orleans by H. A. Sawyer, who has been appointed vice-president and manager.

Edward D. Boyer, Cement Industry Veteran, Retires

A cement industry career which began before the first concrete pavement in America was laid has just come to its formal close with the retirement of Edward D. Boyer as technical service manager of the New York office of the Universal Atlas Cement Co. He has been succeeded by E. K. Borchard, technical service manager, also of New York, who joined the Atlas organization in 1917.

Mr. Boyer is a director and former president of the American Concrete Institute and a past director of the American Society for Testing Materials, and has been for many years a member of the Portland Cement Association's technical problems committee. In his business lifetime he has seen American cement shipments grow from a few thousand barrels a year in the eighties to 160 million today, with producing capacity of 100 million more. He came to New York in 1914 as technical department manager of the Atlas Portland Cement Co., having joined the company in 1902 as assistant to the general superintendent of the Northampton, Pa., plant, its largest establishment.

Only a few straggling American cement mills were daring to compete with the product imported from Europe, and modern large-scale production from rotary kilns for low-price construction markets was undreamed of, back in 1888, the year of Mr. Boyer's entry into the cement business as superintendent of a mill at Cementon, Pa. A native of Catasauqua, Pa., in the now famous cement-producing Lehigh Valley, he had specialized in chemistry at Muhlenberg College, Allentown, and had graduated from the Philadelphia College of Pharmacy as president of the 1877 class of more than 400 members. The cement field had attracted his attention at an early age through the establishment of the first American plant at Coplay, a few miles above his home and college communities, by David O. Saylor in 1872. The first American concrete pavement was to be laid 20 years later at Bellefontaine, Ohio, and by 1897 American cement mills achieved a production exceeding European imports.

Edward D. Boyer, who is retiring from the Universal Atlas Company after 29 years' service

Displacement of the old dump kilns by the new rotary kilns forced the company employing Mr. Boyer to dissolve, and sent him instead to Elizabeth, Pa., in 1900, to build a rotary kiln plant. It was never operated, however, because the patented process of manufacture proved unsuccessful. He then joined the Atlas organization, which was to become united years later with the Universal company, in 1930.

His successor, Mr. Borchard, represented the shipping board during construction of the concrete ship "Faith" at San Francisco, in 1918, and also aided in building other concrete ships and barges. From 1911 to 1916, with headquarters in Philadelphia, he directed promotional work for the Association of American Portland Cement Manufacturers, now the Portland Cement Association.

Ricker Is Appointed Consultant to Planning Commission

George A. Ricker, for many years Washington representative of the Portland Cement Association, has been appointed industrial consultant to the National Capital Park and Planning Commission. The latter is taking an important part in planning the development of the city of Washington and surrounding areas in Maryland and Virginia.

Mr. Ricker was for many years engaged in railroad engineering work. He was in charge of the construction of the Niagara Gorge Railroad and the lines of the Buffalo Traction Co. He was resident engineer of the Buffalo Creek Railroad and planned many of the industrial terminals in the Buffalo harbor district. He was the first deputy commissioner of highways for New York State. He resigned that position in 1915 to become Washington representative of the association.

Ideal Brings in Second Oil Well on Oklahoma Land

The Ideal Cement Company early in May brought in a second large gas well on its 1,200-acre lease in Wewoka-Holdenville, Oklahoma, field.

The new well is flowing 30,000,000 cubic feet daily. The first well on the lease, brought in several months ago, has a capacity of 25,000,000 cubic feet. Plans are under way to drill a third well immediately. The company also has large shut-in gas production on its own property near Ada, Oklahoma, cement plant.

With production from both fields now available, it is understood the company expects shortly to begin using its own gas supply for operation of the plant.

Mackenzie Assistant to Manager of South African Cement Company

W. F. Mackenzie, formerly chief chemist of the Southwestern Portland Cement Company, is now assistant to the general manager of the Pretoria Portland Cement Company, Ltd., Johannesburg, Union of South Africa.

He was with the Southwestern company from 1921 to October, 1929, first at the El Paso, Texas, plant, and later at the Osborn, Ohio, plant.

While in the United States Mr. Mackenzie was a member of the Technical Problems Committee of the Portland Cement Association and a member of Committee C-1 of the American Society for Testing Materials.

Alpha Discontinues Trial Farming on Michigan Deposits

Operation of its several farms near the plant at Bellevue, Michigan, for agricultural experiment purposes has been discontinued by the Alpha Portland Cement Company. Tools and livestock will be auctioned off and the land rented.

The farms were originally purchased because of their lime rock deposits and have been operated by the company to help pay the cost of carrying them.

Mallon Addresses Indianapolis Building Congress

J. H. Mallon of the Louisville (Ky.) Cement Company was the principal speaker at an open forum meeting of the Indianapolis (Ind.) Building Congress held on May 21st.

Banker and Superintendent New Canada Company Directors

C. E. Neill, vice-president and managing director of the Royal Bank of Canada, and F. B. Kilbourn, general superintendent of the Canada Cement Company, have been elected directors of the latter company, at Montreal.

Lightning Puts Superior Plant and Village in Darkness

The Superior Portland Cement Company plant, located at Superior, Ohio, was thrown out of commission temporarily recently when lightning struck the power plant. The village, which derives its power from the plant, was thrown into darkness as well. Workmen under the supervision of Earl Cannon, plant electrician, repaired the damage with such dispatch, however, as to win the commendation of plant officials.

Lawrence Portland New York Office Moves

Quarters more modern and commodious than its former ones have been taken by the New York office of the Lawrence Portland Cement Company, at 270 Broadway.

Great Lakes Appoints Barton Chief Chemist

J. Frank Barton, formerly located at Port Huron, Mich., has joined the Federal Portland Cement Company plant at Buffalo, New York, as chief chemist.

Davis, Founder of Diamond Company, Passes Away Suddenly

Zebulon W. Davis, founder and president of the Diamond Portland Cement Company, Middle Branch, Ohio, died suddenly at his home at Canton, Ohio, on May 2. He was 87 years of age.

Mr. Davis spent the major portion of his time at the Middle Branch offices, althought he maintained offices in Cleveland, where he had numerous business interests. He was also the inventor of numerous devices.

Born in Chester County, Pa., Mr. Davis came to Canton when a youth. At an early age he was the co-inventor of a gasoline lamp and a gasoline stove. It was from the sale of patents on them that he secured his first capital, with which he entered the cement industry.

More than 30 years ago he built the home in which he died. He superintended its construction, using many rare woods from foreign countries.

Mining Students Guests at Colorado Portland Plant

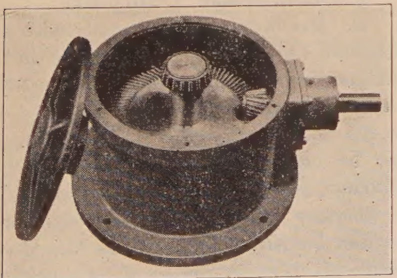
Students at the Colorado School of Mines, Golden, Colorado, were guests of the Colorado Portland Cement Company at the plant at Portland, on April 29.

After a tour of the plant and quarry, luncheon was served the students.

Mill Equipment

New James Vertical Spiral Bevel Gear Speed Reducer

A new speed reducer of the vertical spiral bevel type is announced by the D. O. James Manufacturing Company, Chicago, Illinois.



This unit features smooth, noiseless operation and several novel advantages of design. The gears are made of chrome nickel of spiral bevel type to secure greater efficiency from the improved tooth form which provides more teeth in constant contact and a greater tooth bearing or pressure area in each tooth of given size, it is said. High efficiency is thus provided and a greater delivery of input power made.

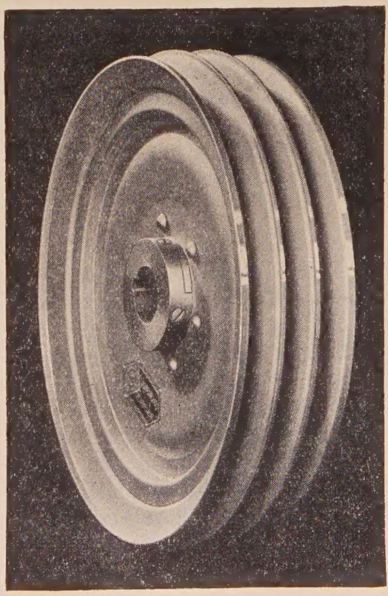
Shafts are made of 40 carbon steel and roller bearings are provided on both drive and driven shafts.

Where large ratios of reduction are required this type of reducer is made integral with a planetary reduction unit so that all ratios from 8 to 1 to 1600 to 1 are available. They are made in sizes from ½ to 100 h.p.

A well designed housing prevents oil leakage and keeps dust and dirt from filtering into the unit, forming a neat, compact drive for use whenever vertical (up or down) driving is required.

New Light-Weight Texsteel Sheaves Developed

A new type of pressed steel Texrope sheave to meet the demands for a light-weight, low-priced drive, has been developed by Allis-Chalmers Manufacturing Company, and complete Texsteel Texrope



drives are available from stock for immediate delivery.

Texsteel sheaves are die pressed from extremely tough steel and then each section is welded both at the web and at the rim to eliminate all vibration and noise and to give an accurate balance for true running.

Dump Car Mounted on Gas-Electric Locomotive Chassis Is New Development

A development said to be unique in conception and design, has recently been perfected by the Differential Steel Car Company, Findlay, Ohio. Essentially it consists of a locomotive chassis with a dump body mounted on it. It is a self-contained unit carrying its own power plant. This locomotive is intended for service in open pit mining and quarry work and in industrial plants.

This gas-electric locomotive has a 24-yard level load dump body on it. The sturdy truck and frame construction has all the features of a locomotive and the dump body allows for a payload to be hauled on the locomotive as well as the trailer cars. The locomotive alone may be used for stock piling and a variable tractive effort may be obtained by varying the load on the body. It is not necessary under the light load conditions to carry the maximum weight on the locomotive. Fuel consumption stops when the switch is cut off.

The equipment weighs 45 tons light and 80 tons loaded. The air brake equipment is Westinghouse combination straight and automatic with Gardner Denver 60-ft. compressor belted from each engine, giving an air capacity of 120 cubic feet per minute.

The power plant is mounted between the center sills and is thus protected in every way from falling material. The radiators are of the sectional type mounted along the side sills and blown by centrifugal fans through holes in the side sills.

About the Manufacturers of Equipment

Industrial Literature

Dieform Fittings Bulletin

A new bulletin entitled "*Dieform Compression Fittings*" is now being distributed by the *Bailey Meter Company*, Cleveland, Ohio.

This bulletin, which is designated as No. 13, fully describes the application, advantages and installation of Dieform compression fittings when used with copper or steel tubing for small service lines. The material is recommended for piping where many bends must be made and where an absolutely tight, neat appearing, trouble free installation is required. It is especially suitable for high pressure and high temperature service such as connections to metering equipment and water, oil, steam, compressed air, and gas lines.

One section of the bulletin describes Dieform test water cooling coils with which representative boiler test water samples may be easily and efficiently obtained.

The bulletin is profusely illustrated in two colors, the figures including installation photographs, types of fittings, methods of bending and flaring tubing, sections of fittings and installation diagrams.

New EC&M Publications

The Electric Controller & Manufacturing Company, Cleveland, Ohio, has recently issued five new bulletins, three new price sheets, bulletin index and checking list.

The new *Bulletin* 910 describes EC&M separator magnets and shows installations illustrating how these separator magnets are installed to remove tramp iron.

Bulletin 1042-*G* supersedes *Bulletin* 1042-*F* describing the low voltage compensators for use with squirrel cage and synchronous motors, while *Bulletin* 1062 describes the new EC&M Type ZHS magnetic contactors specifically designed for reversing and non-reversing high voltage motor applications.

Bulletin 1088 supersedes *Bulletin* 1018-*A* describing motor field rheostats and relays, and *Bulletin* 1105 describes many forms of push buttons.

Positive Drive Descriptions

Link-Belt Company, Indianapolis, Indiana, have just issued a new illustrated book, *No.* 1293, which describes the complete line of positive drives, as follows: Silent chain, roller chain, Herringbone gears, herringbone speed reducers, worm gear speed reducers, steel and malleable chains, and P. I. V. gear.

Many illustrations of installations of these positive drive units are shown, with accompanying description which tells of their scope.

Manitowoc Equipment

A 16-page *General Equipment Bulletin* being distributed by the *Manitowoc Engineering Works*, Manitowoc, Wis., is a compilation of photographs of Manitowoc machinery installations.

Illustrations of cement mill equipment occupy four pages. Included are Minogue slurry agitators, coolers, dryers, kilns, feeders and compartment and tube mills.

Safety in Explosives

The April issue of *Explosives Progress*, published by the *Institute of Makers of Explosives*, New York City, contains data on the safety records being made in the handling and manufacture of explosives.

Copes Equipment Catalog

"*Modern Copes Feed Water Regulation*" is a new catalog published by the *Northern Equipment Company*, Erie, Pa.

Comprising 16 pages, the booklet presents the standard Copes equipment for controlling boiler feed water. The recently developed Type SLH valve and the Type OT regulator are suggested as of special interest.

Field Activities

Allis-Chalmers to Acquire Swiss Products

The Allis-Chalmers Manufacturing Company, Milwaukee, Wisconsin, is about to acquire the electrical divisions of the *American Brown Boveri Company*, giving the former several new products.

Principal among them are mercury arc rectifiers, electric furnaces, switch gear and traction equipment, blowers and compressors. A tentative contract has been made with the Brown Boveri Company of Baden, Switzerland, by which Allis-Chalmers will have the exclusive use of patents and new developments pertaining to these lines.

J. C. McQuiston Retires from Westinghouse Company

J. C. McQuiston, general advertising manager of the Westinghouse Electric and Manufacturing Company, has announced his retirement effective June 1, 1931.

In his decision to retire from Westinghouse he brings to an end a record of continuous advertising administration for one company said to be unparalleled in American industry. For 29 years Mr. McQuiston has been in charge of advertising for Westinghouse Electric during which time the status of advertising and sales promotion, distribution and other allied phases of his profession have gone through as many changes as the electrical industry itself.